

# ***Veterinary Public Health Handbook***

## ***A Practical Guide for Animal Health Workers in South Sudan***



**Vétérinaires Sans Frontières Suisse**



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# ***Veterinary Public Health Handbook***

***A Practical Guide for Animal Health Workers in South Sudan***

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South Sudan Program

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## Preface

The development of this handbook was funded by USAID Office of Foreign Disaster Assistance (OFDA) under the Livestock Emergency Response Project. The need and relevance for this handbook cannot be overemphasized. Close interaction with livestock and other zoonotic pathogen reservoirs such as dogs, cats and wildlife increase risks of exposure to zoonotic diseases such as anthrax, tuberculosis, brucellosis, avian influenza, hydatidosis, rift valley fever and rabies. The prevalence of zoonotic and animal related food borne diseases have caused considerable disease burden among human and livestock populations and significant strain on community based health care systems. Community based animal health workers that provide frontline animal healthcare services, including quality control for livestock and livestock products (health certifications and meat, milk and fish quality inspections) are exposed and at risk of contracting zoonotic diseases. Vendors in the livestock value chains such as livestock traders, slaughter personnel, meat inspectors, butchers, milk vendors, fish traders and consumers of livestock products are similarly at risk. The situation is exacerbated by poor knowledge base, prevalent attitudes and practices due to lack of basic information, communication and education on the prevention and control of zoonotic diseases among human and livestock populations, and the general poor state of sanitation and hygiene situation and lack of access to safe drinking water.

One of the key intervention strategies of the Livestock Emergency Response Project was to address a range of veterinary public health needs. The project applied proven information, education and communication (IEC) techniques to influence behavior change for improved public health outcomes regarding zoonotic and food-borne disease risks among agro-pastoralist communities. The production of this handbook is aimed at refining the approach by developing user friendly practical guide for frontline extension workers and other change agents to manage the identified veterinary public health needs and challenges. This handbook will be used by frontline public health extension workers to administer public health basic skills training and awareness campaigns on prevention and control of zoonoses and food borne diseases of livestock based food products. The handbook development followed an elaborate process of consultations with livestock keepers at cattle camps, meat traders, milk vendors, fish vendors, slaughter site workers, county directors of public health, veterinary services, medical services, wildlife department, town council, aid agencies in livestock, medical and public health informants from Rubkona and Aweil East Counties and Aweil, Bor and Juba towns.



## Table of Contents

Acknowledgement .....	ii
Preface .....	iv
Table of contents .....	vi
Abbreviation and acronyms.....	xii
Introduction .....	xiii
<b>PART ONE: MEAT HYGIENE .....</b>	<b>2</b>
<b>Anthrax.....</b>	<b>5</b>
Signs of Anthrax in human.....	5
Transmission of Anthrax from animals to human .....	7
Transmission of Anthrax from animal to animal.....	8
Practices that facilitate transmission of Anthrax.....	9
Prevention and control of Anthrax.....	9
<b>Brucellosis .....</b>	<b>10</b>
Signs of Brucellosis in human .....	10
Signs of Brucellosis in animals .....	11
Transmission of Brucellosis.....	12
Prevention and control of Brucellosis .....	13
<b>Botulism.....</b>	<b>14</b>
Signs of Botulism in human .....	14
Signs of Botulism in cattle, sheep and goats .....	16
Prevention and control of Botulinum food poisoning.....	17

<b>Tapeworms - Cysticercosis</b> .....	18
Signs of tapeworms in human .....	18
Signs of Cysticercus bovis in animals .....	19
Transmission of cattle tapeworms to human .....	20
Prevention and control of Tapeworms.....	21
<b>Hydatidosis</b> .....	22
Signs of Hydatidosis in human, dogs and cattle.....	22
Transmission of Hydatidosis from animals to human .....	23
Transmission of Hydatidosis from animals to human .....	23
Risk factors for infection with Hydatidosis.....	25
Prevention and control of Hydatidosis.....	25
<b>Contamination and spoilage of meat</b> .....	26
Sources of contamination and spoilage of meat .....	26
Consequences of contaminated and spoilt meat.....	27
Prevention of contamination and spoilage of meat.....	27
<b>Transportation and packaging of meat</b> .....	28
Packaging of meat .....	29
<b>Meat Inspection</b> .....	31
Ante-mortem inspection of ruminants .....	32
Post-mortem inspection of ruminant meat .....	34
Actions during inspection.....	39

Inspection of fish .....	40
<b>PART TWO: MILK HYGIENE.....</b>	<b>46</b>
Brucellosis .....	47
Transmission of Brucellosis from animals to human, through milk .....	47
Milk hygiene practices to reduce Brucellosis.....	48
<b>Tuberculosis.....</b>	<b>48</b>
Signs of bovine Tuberculosis in human .....	48
Signs of Tuberculosis in cattle.....	49
Transmission of Tuberculosis .....	50
Risk factors for infection by Tuberculosis .....	51
Prevention and control of Tuberculosis .....	51
<b>Milk contamination and spoilage.....</b>	<b>52</b>
Consequences of contaminated and spoilt milk.....	53
Prevention of contamination and spoilage of milk.....	53
<b>Transportation and packaging of milk .....</b>	<b>55</b>
<b>PART THREE: RABIES .....</b>	<b>57</b>
Signs of Rabies in human.....	58
Signs of Rabies in dogs .....	59
Signs of Rabies in cattle .....	60
Transmission of Rabies.....	61
Prevention and control of rabies.....	63

Other human disease conditions associated with dogs and cats.....	66
<b>Jiggers and fleas</b> .....	66
Signs of Jiggers in human .....	66
Infestation cycle of Jiggers.....	67
Risk factors for infestation with jiggers and fleas .....	68
Prevention and control of jiggers and fleas.....	68
<b>Toxoplasmosis</b> .....	69
Signs of Toxoplasmosis in human .....	69
Signs of Toxoplasmosis in cats .....	69
Transmission of Toxoplasmosis .....	70
Risk factors for infection of Toxoplasmosis.....	71
Prevention and control of Toxoplasmosis .....	71
<b>PART FOUR: ZOONOSES ASSOCIATED WITH INSECTS</b> .....	72
Trypanosomiasis .....	73
Signs of Trypanosomiasis in human .....	73
Signs of Trypanosomiasis in animals .....	74
Transmission of Trypanosomiasis .....	75
Risk factors for infection by Trypanosomiasis.....	76
Prevention and control of Trypanosomiasis .....	76
<b>Rift Valley Fever</b> .....	77
Signs of Rift Valley Fever (RVF) in human .....	77

Signs of Rift Valley Fever in animals .....	79
Transmission of Rift Valley Fever .....	80
Risk factors for infection by Rift Valley Fever.....	81
Prevention and control of Rift Valley Fever .....	81
<b>PART FIVE: FOOD SAFETY AND HYGIENE.....</b>	<b>82</b>
Food contamination and food poisoning.....	83
Signs of common food contamination .....	83
Transmission of common food contamination .....	86
General risk factors for food contamination.....	87
Prevention of food contamination.....	87
<b>PART SIX: POULTRY ZOOSES.....</b>	<b>89</b>
Avian Influenza.....	90
Signs of Avian Influenza in human.....	90
Signs of Avian Influenza in chicken and birds.....	91
Transmission of Avian Influenza .....	92
Risk factors and persons at risk of infection .....	93
Prevention and control of Avian Influenza .....	93
Newcastle disease .....	94
Signs of Newcastle disease in human.....	94
Signs of Newcastle in poultry .....	94
Transmission of Newcastle disease.....	95



Prevention and control of Newcastle disease .....	96
<b>PART SEVEN: BUSH MEAT .....</b>	<b>97</b>
Signs of Ebola in human.....	98
Transmission of Ebola.....	99
People at risk of infection by Ebola.....	100
Prevention and control of Ebola.....	101
<b>PART EIGHT: HANDLING OF DRUGS, MEDICINES AND OTHER MEDICAL PRODUCTS .....</b>	<b>103</b>
Forms of poor handling.....	104
Dangers of poor handling.....	105
Safe handling and disposal of drugs, medicines and medical materials.....	106
<b>Glossary .....</b>	<b>108</b>
<b>Bibliography .....</b>	<b>109</b>

## Abbreviation and acronyms

AIDs	Acquired Immune Deficiency Syndrome
AHA	Animal Health Auxiliary
EHF	Ebola Hemorrhagic fever
CAHWs	Community Animal Health Workers
CDC	Centers for Disease Control and prevention
FAO	Food and Agriculture Organization
HAT	Human African Trypanosomiasis
HIV	Human Immune-deficiency Virus
IEC	Information, Education and Communication
OIE	World Organization for Animal Health
OFDA	Office of Foreign Disaster Assistance
RVF	Rift Valley Fever
TB	Tuberculosis
USAID	United States International Agency for Development
VSF	Vétérinaires sans Frontières
WHO	World Health Organization

## Introduction

Agro-pastoralist communities in South Sudan traditionally have close interaction with livestock in their daily routine livestock management practices. The World Organization for Animal Health (OIE) estimates that 60% of human pathogens are zoonotic (infect animals and human). The organization also reports that 75% of emerging diseases are zoonotic and nearly all emerging (new) human diseases originate from animal reservoirs.

Brucellosis, Tuberculosis, Anthrax and Rabies are endemic in South Sudan, with outbreaks and treatment of suspect cases routinely reported at community level health facilities in the country. Brucellosis is a zoonotic disease with significant impact in the national economy and the public health of many developing countries. Word Animal Health Organization (WHO) estimates the incidence of tuberculosis (TB) in South Sudan among human to be at 79 per 100 000 for new sputum smear positive TB and 140 per 100 000 for all forms of TB cases. Evidence suggest that zoonotic TB in the Western world accounted for significant proportion of the TB cases before the introduction of regular milk pasteurization programs, indicating that through proper handling of milk, cases of human TB would drastically be reduced in South Sudan if occurrence of the disease is similar to the form that was in the Western world. The prevalence of food poisoning, food contamination, cholera and typhoid are associated with unhygienic handling of foods by consumers, producers and food vendors. Other prevalent conditions associated with close contact with livestock are hydatidosis, fleas and jiggers.

About 38.5% of South Sudan territory is tsetse-infested and human African Trypanosomiasis (HAT) is prevalent in the Equatoria States bordering Central Africa Republic, The Democratic Republic of Congo, Uganda and Kenya. However, Trypanosomiasis constitutes health problems in almost all the states in South Sudan, causing substantial economic impact on the livelihoods of pastoralists and agro-pastoralists. Anthrax occurs sporadically among animals in Eastern Africa and is considered enzootic. Its occurrence is associated with high mortality among livestock and adverse economic effects.

According to Centers for Disease Control and Prevention (CDC), (2016), since the first reporting of Ebola in Zaire in 1976, there have been major outbreaks in West African countries, The Democratic Republic of the Congo (DRC), Uganda and South Sudan. In 2004, 17 cases including 7 deaths were reported from Ebola hemorrhagic fever (EHF) from Yambio County in southern Sudan. In December 2012 at least 11 cases of Ebola virus infection were reported in Uganda, including 4 deaths. The outbreak in Uganda, caused high alert in South Sudan due to active human movement between the two countries. Measures were instituted at border cross points to control entry of the diseases into South Sudan. In 2014, there were wide spread outbreak of Ebola in West Africa until 2015. Over 11,000 deaths were reported and about 27,000 cases, occurred in the West Africa outbreak during 2014 and 15, the largest in the history of the disease.

In 2006, avian influenza outbreaks were reported among poultry in Egypt; these reports were followed by 38 laboratory-confirmed cases and 15 human deaths. The following year, influenza virus (H5N1) was detected in fowl in 8 countries neighboring Nigeria and Egypt. That year outbreaks of avian influenza continued in Nigeria with 24 of 36 states reporting documented avian influenza in poultry. In many other countries in East and West Africa, bird die-offs were reported.

Overall, the management of veterinary public health challenges and the response to the veterinary public health needs of the agro-pastoral communities in South Sudan, especially among the vast majority of the rural dwelling communities has been slower and poorly coordinated. This has been exacerbated by lack of appropriate resource materials for effective delivery of information, communication and education during awareness raising sessions by the frontline community based animal health workers and their human counterparts.

This handbook is intended to be used as a simple illustrated practical guide by frontline animal health workers during awareness raising campaigns on the risks, dangers, prevention and control of common zoonotic diseases encountered in the country. It can also be used as a reference material during training sessions targeting community change agents and volunteers on public health matters. Effective use of this handbook and the posters is expected to result in improved level of awareness by communities on zoonotic conditions as well as behavioral changes and practices that minimize risks to exposure. This should lead to a reduction in zoonotic disease burden and positive health outcomes among human population for a more productive and fulfilling life



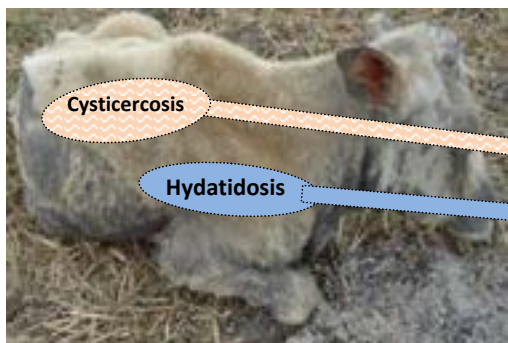
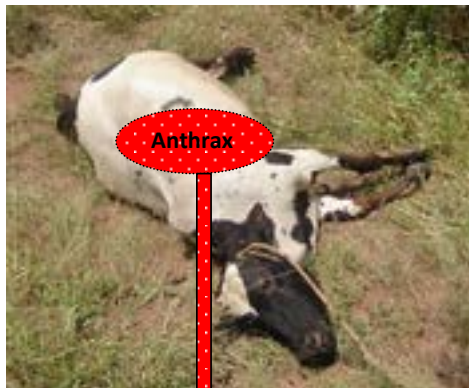
## PART ONE: MEAT HYGIENE



## Meat Hygiene

Meat for human consumption should be safe from any diseases that can result into sickness of the consumer. Unhygienic meat may cause disease to humans either by transmitting disease from livestock to human or from environment to human.

Diseases that can be transmitted from livestock to human (zoonoses) through consumption or handling of infected meat are: -



Diseases transmitted from environment to man through consumption of infected meat are: -





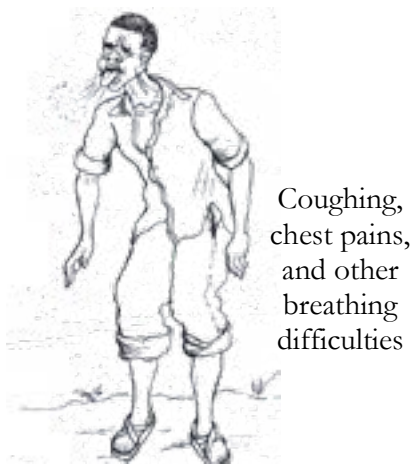
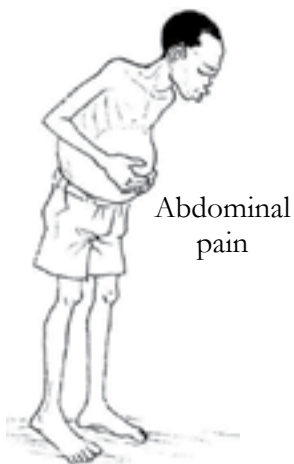
## Anthrax

Anthrax is caused by the bacteria *Bacillus anthracis*. It affects cattle, pigs, goats, sheep, human and other herbivores.

### Signs of Anthrax in human

Three groups of signs depending on route of infection: -

1. Intestinal signs; abdominal pains.
2. Respiratory problems; coughing, chest pains and rales.
3. Skin signs; sores and wounds.



## Signs of Anthrax in animals



Sudden death: healthy, well fed animals die suddenly



After death of the animal, bleeding from body openings – nose, ears, mouth, anus and vulva



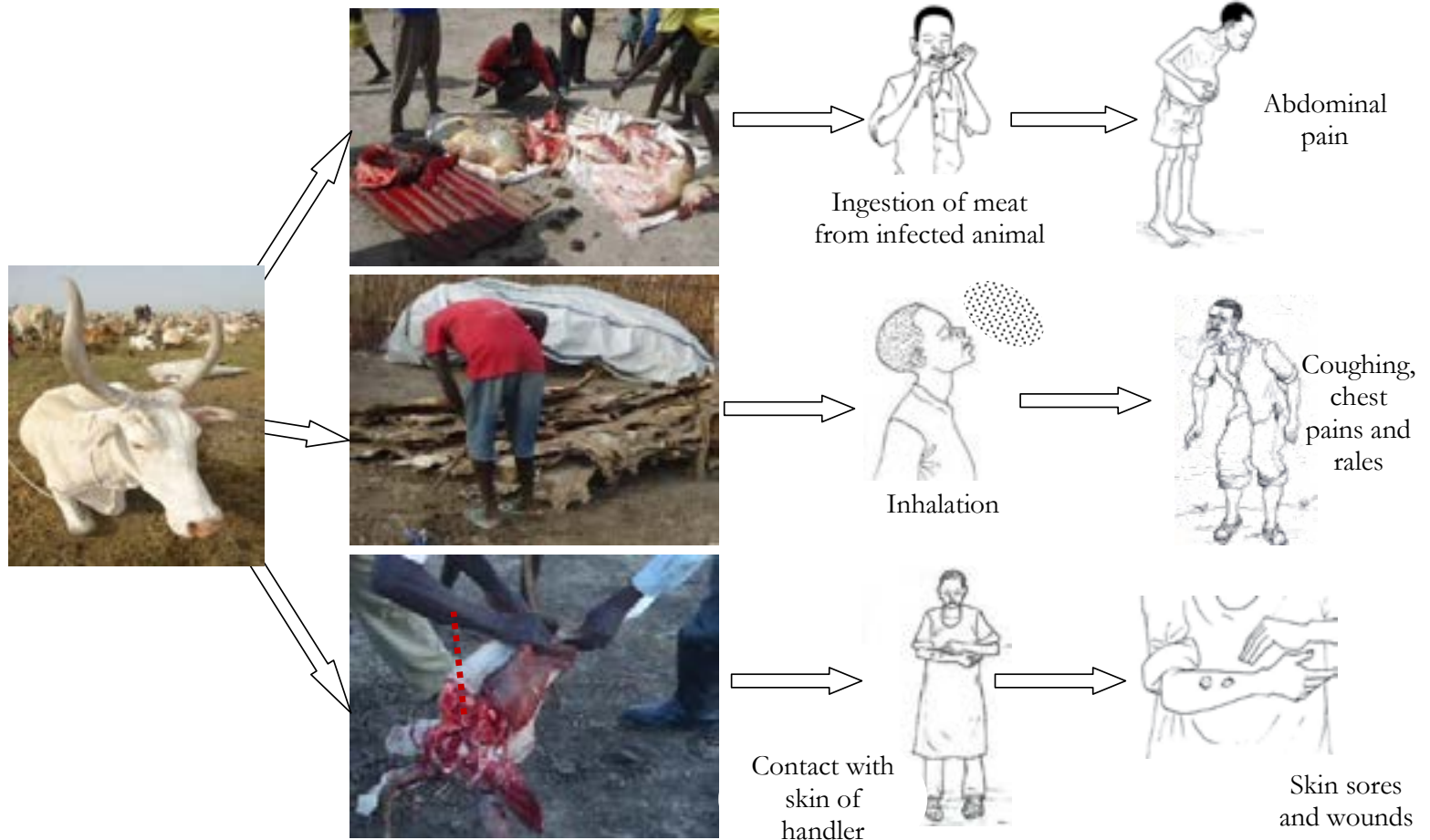
Sick animal in good body condition moving and staggering in cycles before suddenly dropping dead

In livestock, the disease progresses quite rapidly and commonly no clinical signs are observed before death.

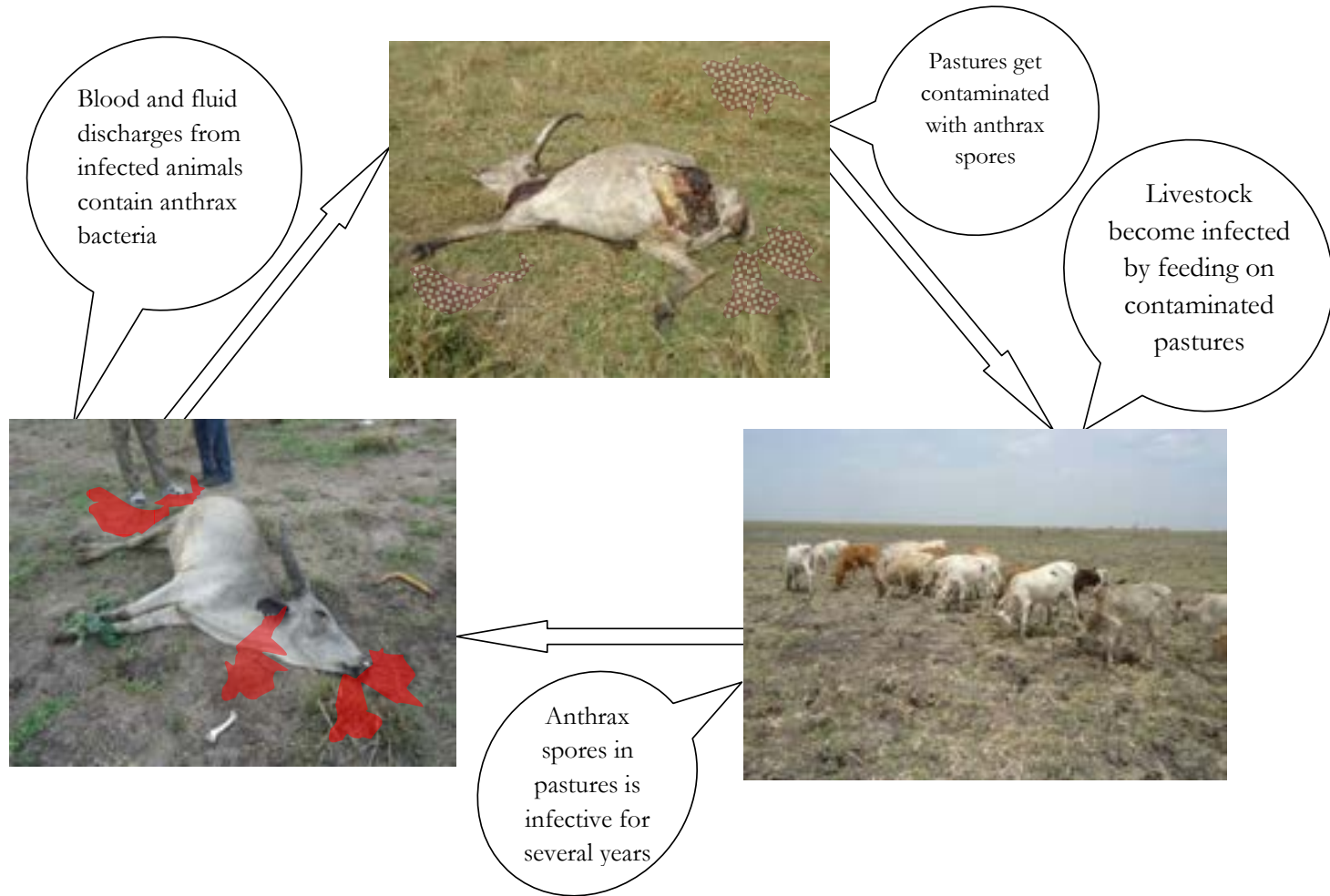
Some sick animals may show some brief signs before death:

- Fever
- Loss of appetite,
- Trembling of muscles,
- Staggering in cycles
- Drops down and dies

## Transmission of Anthrax from animals to human



## Transmission of Anthrax from animal to animal



### **Practices that facilitate transmission of Anthrax**

- Handling of infected animals /carcasses without protection
- Consumption of uninspected meat
- Slaughter of animals which have died of anthrax.
- Conducting post-mortem on carcass of animals that died of anthrax.
- Persons that slaughter animals or handle meat while they have wounds or cuts on their body.
- Improper disposal of anthrax carcasses e.g. in open ground.
- Allowing scavengers to eat dead carcasses leads to contamination of pastures.
- Handling of hides and skins of animals that died of anthrax
- Grazing livestock in pastures contaminated with anthrax spores
- Transporting or moving animals from one area to another without health certifications and or permits.

### **Prevention and control of Anthrax**

- Livestock should be properly inspected before slaughter and carcasses inspected and declared fit for consumption
- Never eat meat that is not inspected.
- Do not slaughter animals that die suddenly and the cause of death is unknown.
- Do not cut open animals that have died from suspected case of anthrax.
- Livestock owners should not present sick livestock for slaughter or for sale.
- Animals suspected to have died of anthrax should be buried 6 feet deep or burned.
- Dead animals should not be left to decompose in the open grazing areas
- Suspected cases of anthrax should be reported promptly to the veterinary services.
- Movement of livestock from and into affected locations should be restricted.
- Susceptible livestock should be vaccinated at least twice yearly against anthrax

## Brucellosis

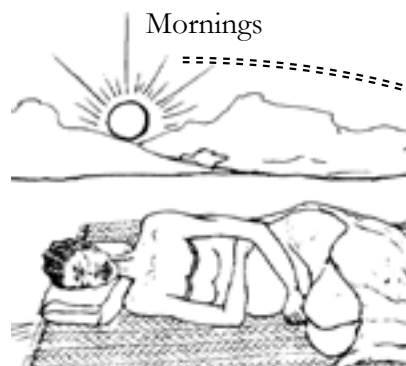
Brucellosis affects goats, sheep, cattle and human.

Pigs and dogs are also affected but rarely.

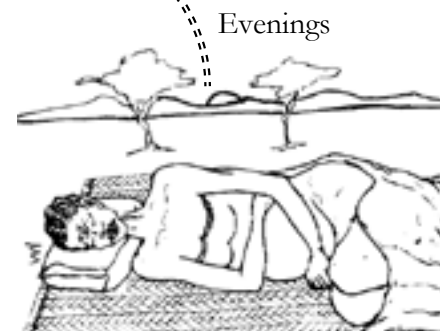
Brucellosis is caused by the bacteria *Brucella mellitensis*, *Brucella abortus*, *Brucella suis* and *Brucella canis*

In livestock, the bacteria mainly affects reproductive organs and is found in large concentrations in the uterus of infected females. In human the disease presents as a generalized condition.

### Signs of Brucellosis in human



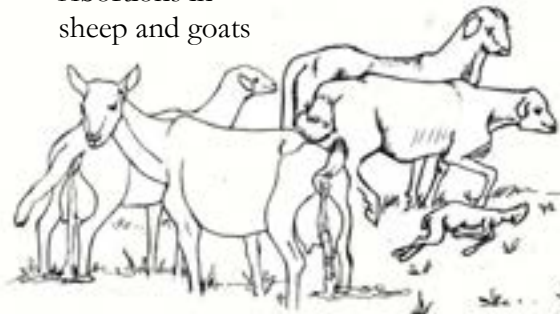
Chills, fever and joint pains are on and off in the mornings and in the evenings – hence “undulating/intermittent fever”





## Signs of Brucellosis in animals

Abortions in  
sheep and goats

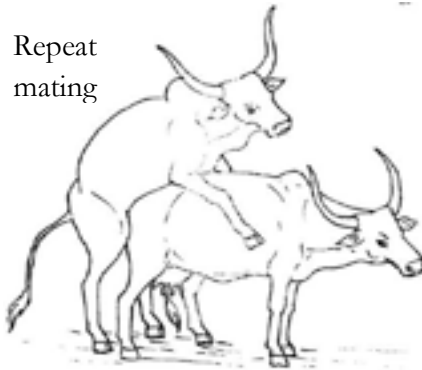


Death of  
lambs and  
kids

Lambs and  
kids born  
are weak



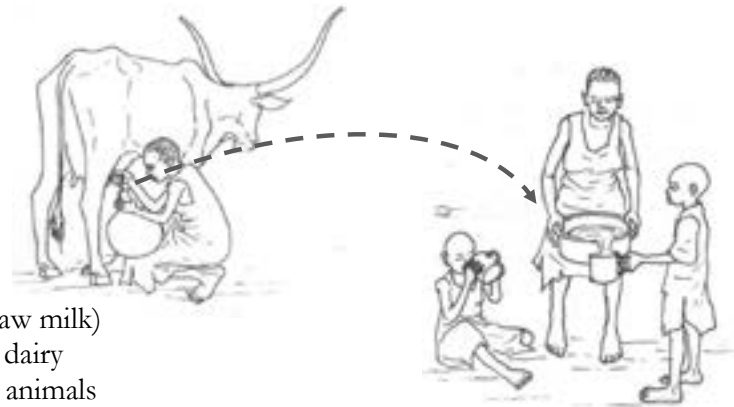
Repeat  
mating



Retained placenta

## Transmission of Brucellosis

Contact with blood and other fluids from infected animals with opening on skin and mucus membranes of handler (butcher, slaughter personnel, person cooking meat or animal health worker)



Drinking of unboiled (raw milk) and consumption of dairy products from infected animals



### Practices that facilitate transmission of Brucellosis

- Handling of aborted material or after-birth without protective arm sleeves.
- Persons that slaughter animals or cut meat while they have wounds or cuts on their body.
- Handling of uninspected meat.
- Consumption of unheated/unpasteurized milk.
- Consumption of dairy products prepared from unheated/unpasteurized milk.
- Suckling milk directly from the teats of a goat, sheep or cow.

### Prevention and control of Brucellosis

- Livestock should be properly inspected before slaughter to ensure no signs of Brucellosis.
- Non inspected meat should not be handled at home.
- Milk should be properly heated/boiled/pasteurized before consumption.
- Dairy products should be prepared only from properly heated/pasteurized milk.
- Never suckle milk directly from the teats of a goat, sheep or cow.
- Aborted material or after-birth should never be handled without protective arm sleeves.
- Wash hands and arms thoroughly after handling births, abortions and meat.
- Suspect infected material should be burnt.
- Suspect cases should be reported promptly.



Livestock should be properly inspected before slaughter. Inspector should obtain good background history to ensure no recent abortions, retained placenta, repeat breeding, fever, weakness or dullness



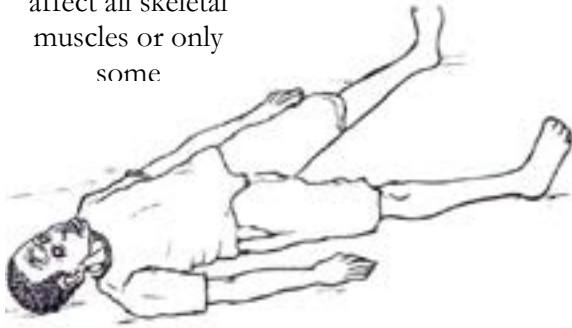
After-birth and aborted material should only be handled with protective arm sleeves

## Botulism

Botulism is a disease condition caused by ingestion of toxin with food, especially meat. It is caused by toxins of the bacteria *Clostridium botulinum*.

### Signs of Botulism in human

Paralysis; may affect all skeletal muscles or only some



Breathing difficulties



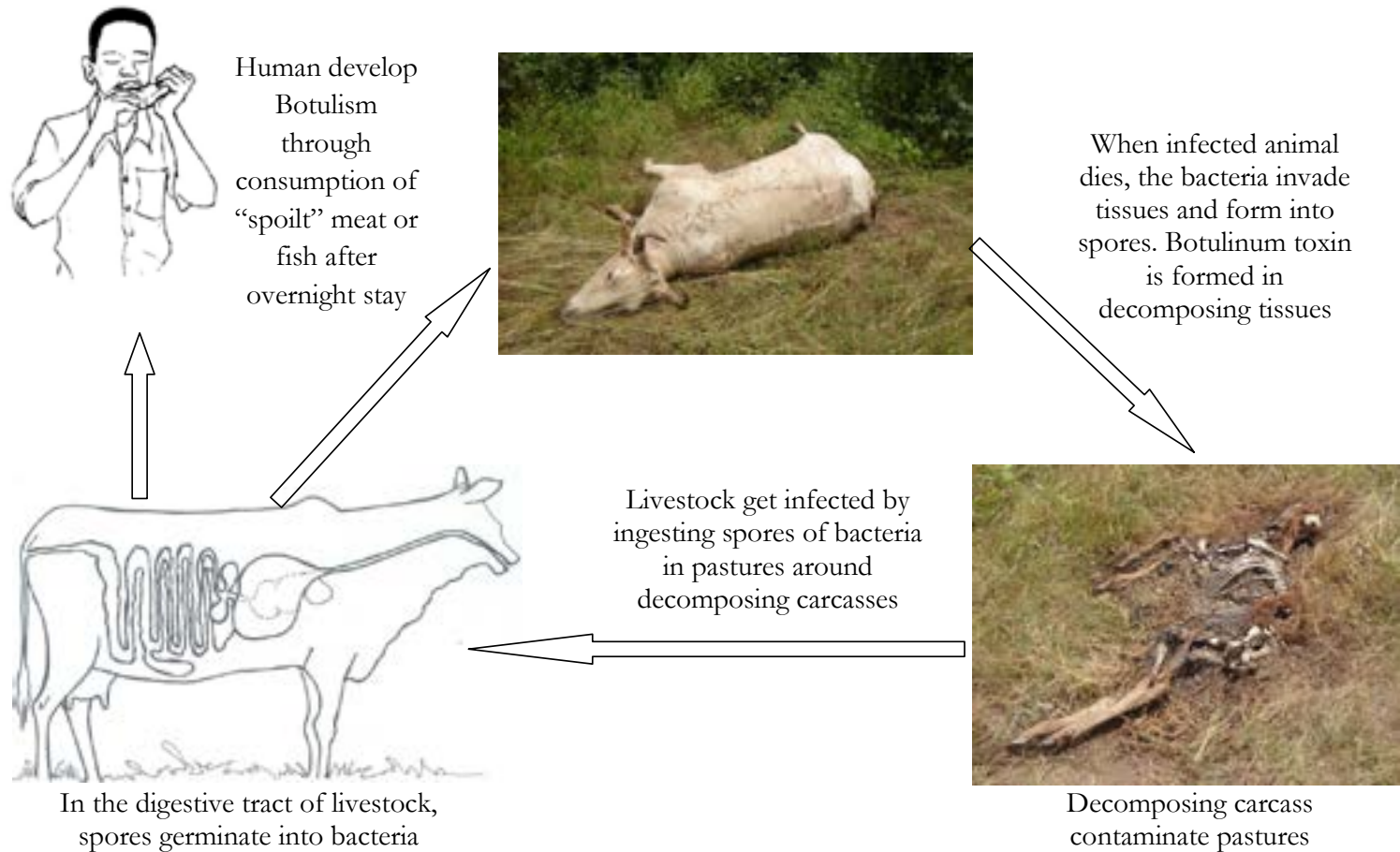
Disturbed vision  
- Double vision  
- Blurred vision

Difficulty in swallowing



Drooling and paralysis of muscles of the face – drooping eyelids, slurred speech

## Transmission of Botulism



## Signs of Botulism in cattle, sheep and goats



Breathing difficulties; mouth is open during breathing, whole length of body moves during inhalation and exhalation. Head is always bent downwards



Drooping and paralysis of muscles of the face – the cheek muscles, ears and eyelids fold downwards. The tongue protrudes and hangs downwards. The eyelids may look swollen



Animal is recumbent on the chest but later, recumbent side ways

### **Risk factors for Botulinum food poisoning**

- Consumption of “spoilt” previously cooked meat warmed only slightly.
- Carcasses poorly disposed off into pastures are likely to develop Botulinum and toxin during decomposition.
- Botulinum bacteria also develop in decomposing green material including grass and vegetables.

### **Prevention and control of Botulinum food poisoning**

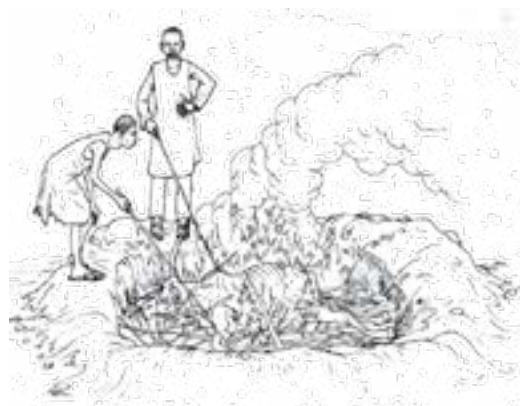
- Proper storage of meat, preferably by refrigeration
- Proper heating/boiling of meat and other foodstuffs before eating
- Prevent infection of pastures through proper disposal of dead animals – by burying 6 feet deep or burning.
- Report sick cases immediately for medical or veterinary attention.



Boil/heat meat properly  
before consumption



Disposal of carcasses by  
burying 6 feet underground



Disposal of carcasses  
by burning

## Tapeworms - Cysticercosis

Common zoonotic tapeworms are cattle tapeworms *Cysticercuss bovis* (*Taenia saginata*) and pig tapeworms *Cysticercus solium* (*Taenia solium*). In human, the parasites exist as tapeworms which are the adult forms while in cattle and pigs, they exist as cysts.

### Signs of tapeworms in human

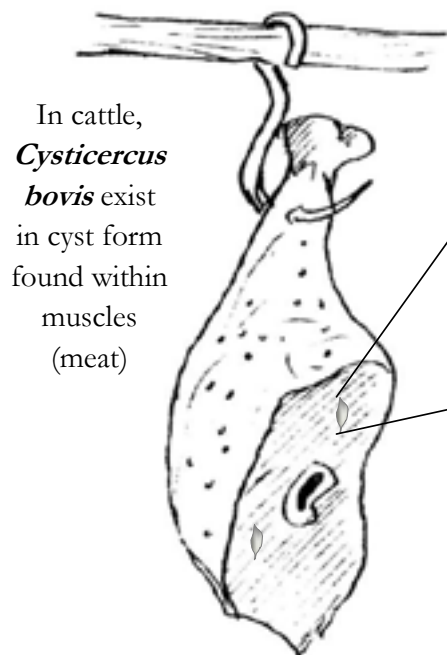
Most commonly there are no clear clinical signs among people infested with Tapeworms. However in some cases, the following signs are apparent: -

- Abdominal pain,
- Itching around the anus,
- Nausea,
- In children, worm segments are likely to be found on the legs after they emerge from the anus.

In some people, the following signs occur, but are very rare signs: -

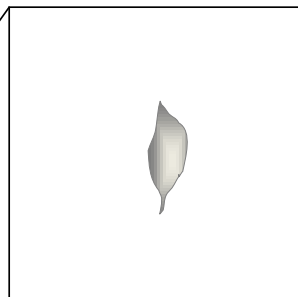
- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>– Diarrhea or constipation,</li><li>– Dizziness,</li><li>– Headache,</li><li>– Increased appetite,</li></ul> | <ul style="list-style-type: none"><li>– Vomiting,</li><li>– Weakness, and</li><li>– Weight loss.</li></ul> |
|--|--|

## Signs of *Cysticercus bovis* in animals



In cattle, *Cysticercus bovis* exist in cyst form found within muscles (meat)

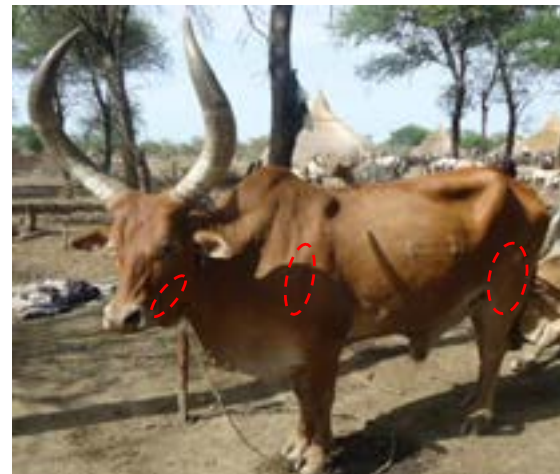
During meat inspection, heavy muscles are incised to check for the cysts



The cysts are fluid-filled, cream-white and rice grain sized

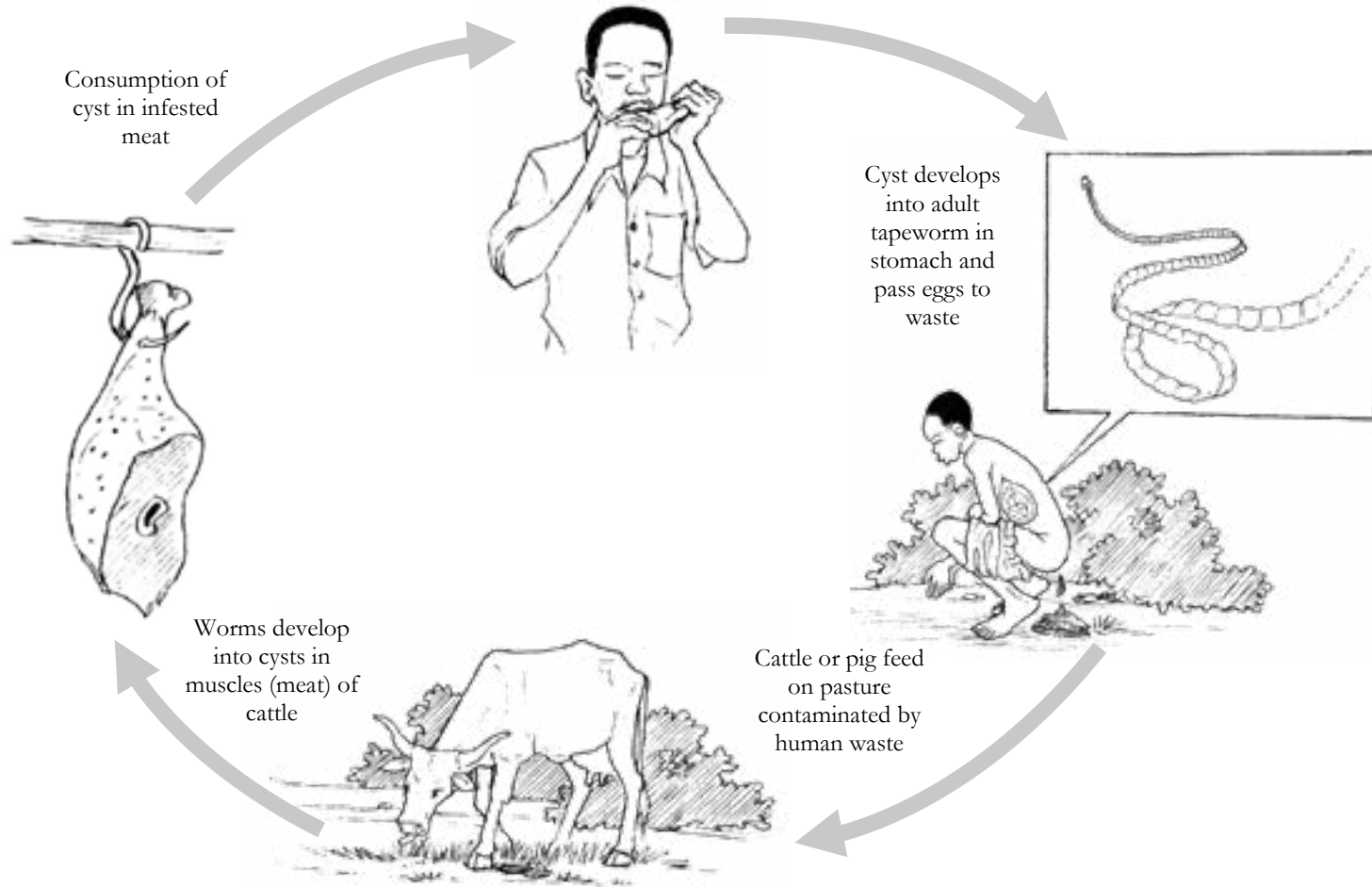
Only few cysts may be seen in the muscles and is enough evidence of infestation

Cysts prefer heavy muscles of the thigh, shoulder, jaw (mandibles), arm and tongue where glucose and oxygen flow more steadily





## Transmission of cattle tapeworms to human

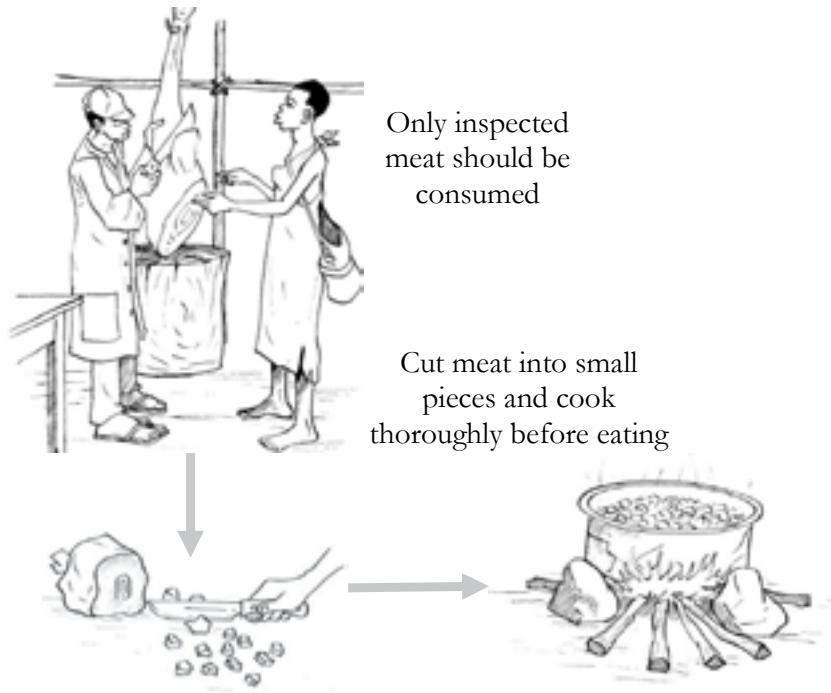




**Risk factors for infestation with *Cysticercosis bovis* and *Cysticercosis solium***

- Consumption of uninspected meat.
- Consumption of poorly cooked meat

**Prevention and control of Tapeworms**



Latrines should be used for human waste disposal in order to prevent contamination of pastures with feces

# Hydatidosis

Hydatidosis is the infestation with dog tapeworm *Echinococcus granulosus*. Hydatid affects dogs, human and cattle. Different development stages of the tapeworm occur in these hosts.

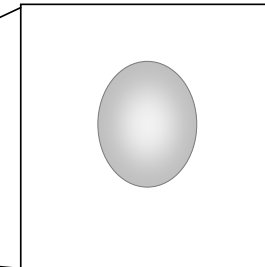
## Signs of Hydatidosis in human, dogs and cattle

Swollen  
abdomen

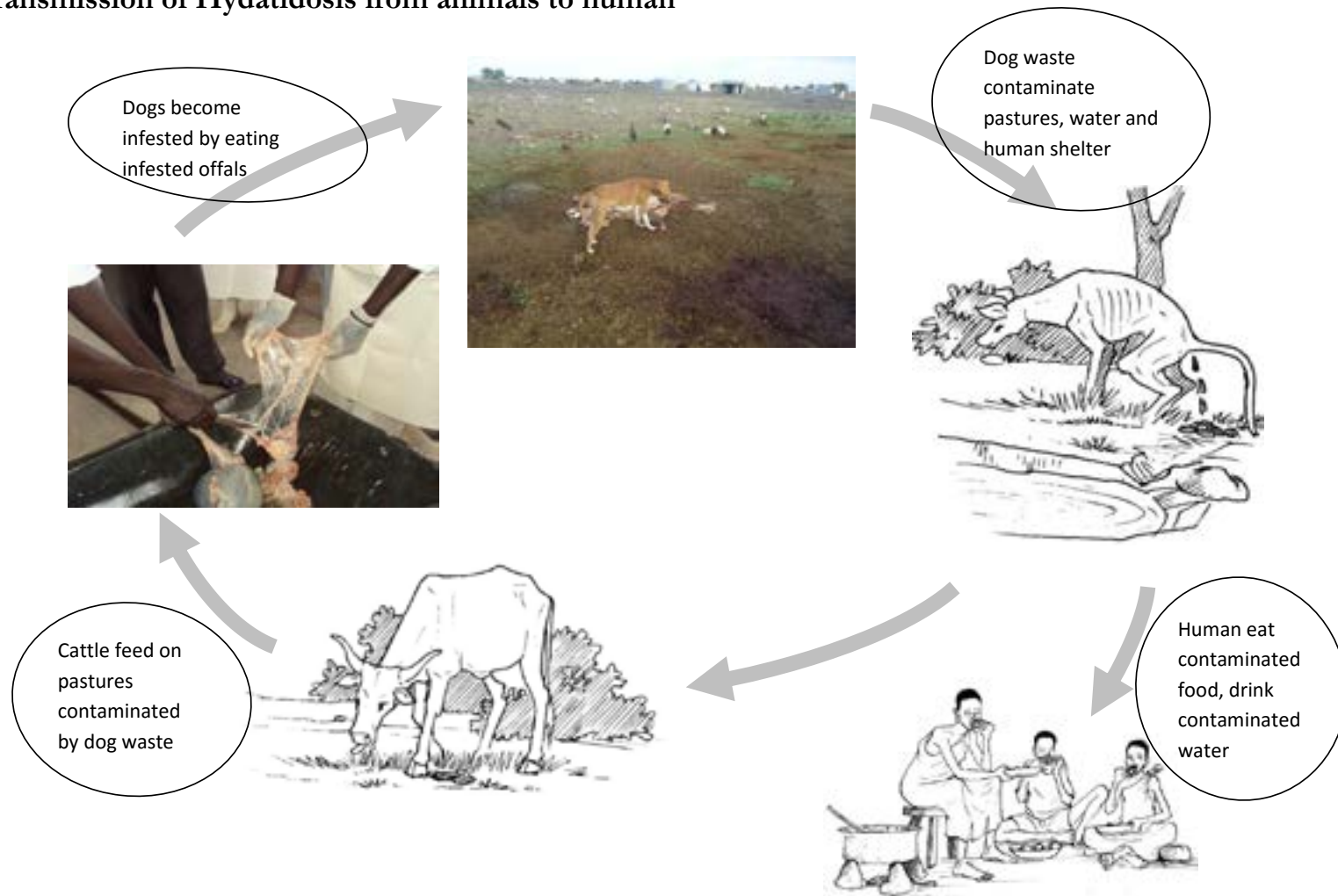


No signs are  
seen in the live  
dog

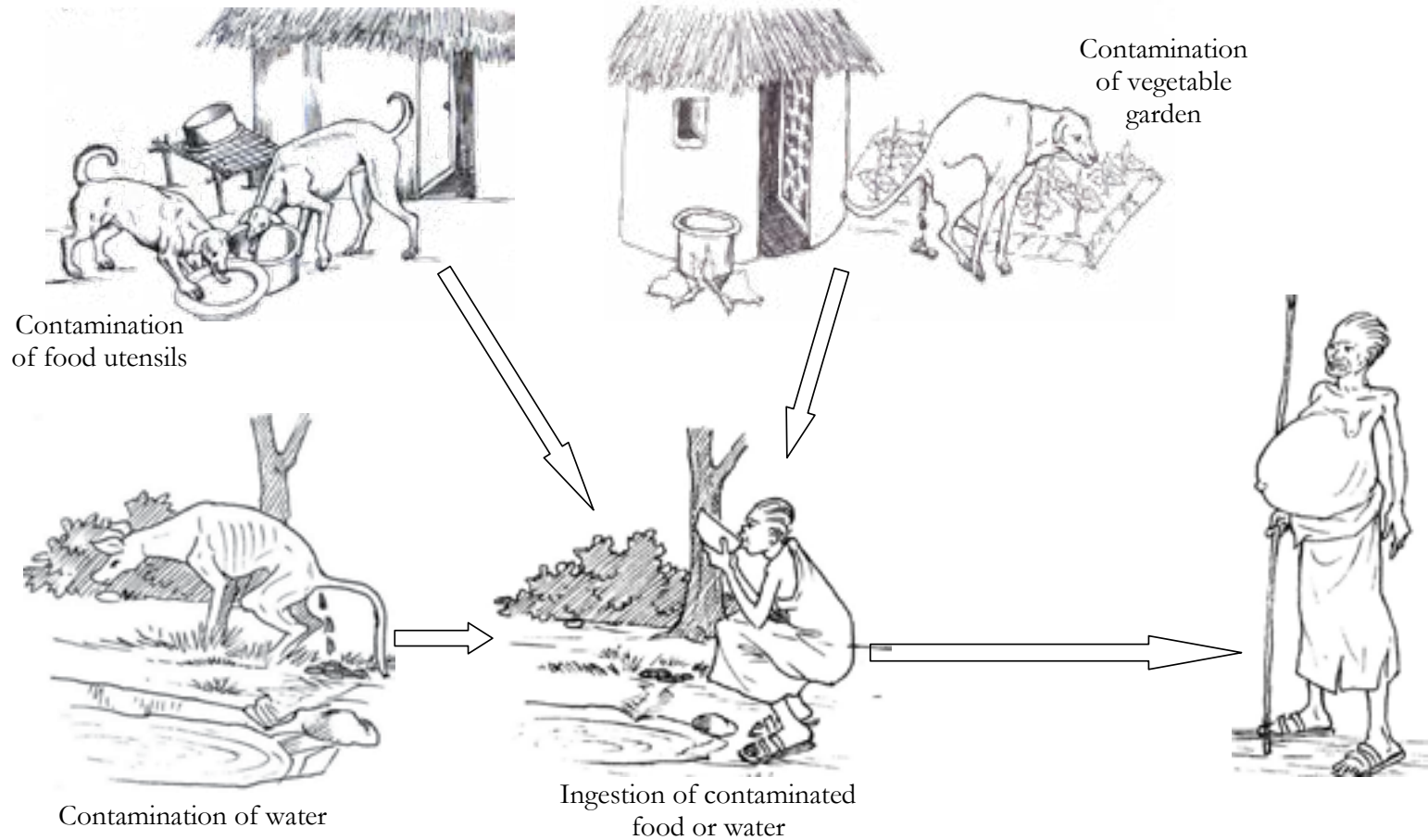
In cattle, there are no clinical signs in the live animal. However, at post-mortem there are cysts in tissues of the animal. The cysts are fluid filled, translucent; spherical structures about 6 cm in diameter



## Transmission of Hydatidosis from animals to human



Human acquire dog tapeworms through consumption of contaminated food, drinking contaminated water, or use of contaminated food utensils or poor personal hygiene e.g. eating without washing hands after close contact with dogs.



### **Risk factors for infection with Hydatidosis**

- Playing with dogs that have not been de-wormed as required
- Allowing dogs to leak kitchen utensils
- Poor disposal of carcasses or slaughter wastes
- Eating raw or poorly cooked meat
- Poor disposal of slaughter waste
- Allowing dogs to defecate at the kitchen garden.
- Poor health care for dogs---lack of routine deworming

### **Prevention and control of Hydatidosis**

- Cook meat properly before eating
- Only inspected meat should be consumed
- Slaughter house should be fenced off from scavengers
- Proper disposal of slaughter wastes
- Proper hygiene for kitchen utensils
- Timely de-worming of dogs and proper disposal of their wastes –collect and dump in a pit
- Sick people should be taken to hospital promptly.
- Good personal hygiene e.g. washing hands before eating
- Boiling water before drinking

## Contamination and spoilage of meat

Contamination of meat occurs when dirty material contacts meat and introduce micro-organisms that cause disease to consumers and spoilage of meat. Meat spoilage occurs when meat is contaminated and changes from safe meat to a form that is unsuitable for human consumption. Signs of meat spoilage are change in color from reddish brown to dark green or dark brown, bad smell, fluids, maggots and flies.

### Sources of contamination and spoilage of meat

- Dirty slaughter place
- Dirty slaughter workers
- Dirty slaughter tools and equipment
- Dirty transportation containers
- Dirty butchery
- Dirty butchers
- Dirty packaging materials
- Dirty kitchen
- Dirty kitchen utensils
- Spoilage of meat can be caused by other physical bodies, toxic fumes and or chemicals that change it into a form or state that is unsuitable for human consumption e.g etc



**BAD**

## Consequences of contaminated and spoilt meat

- Diseases – Cholera, Influenza (Common cold), E-coli enteritis, Botulism
- Economic loss.

## Prevention of contamination and spoilage of meat

- Proper hygiene - Hygiene of slaughter tools, slaughter equipment, slaughter place, slaughter workers, transportation containers, butchery, butchers, kitchen, kitchen utensils and hygienic packaging.
- Proper slaughter place.
- Proper butchery.
- Proper tools and equipment – tools and equipment should be easy to clean. For cutting of bones saws should be used.
- Proper attire for meat handlers – Over coat, overalls, cap/hood, gumboots, gloves and apron.
- Proper slaughter procedures- ante mortem and post-mortem inspections
- Meat preservation.

## Methods of meat preservation

- Heating – by boiling, frying, grilling, roasting, stew and other methods.
  - Salting
  - Drying
  - Canning
  - Smoking
  - Chilling such as by freezers.
- In order for the method of preservation to be efficient, meat is chopped into smaller pieces that can be reached by salt, heat, sunshine, smoke or cold temperature. This is done using knife and saws or by mincing. Cutting can be into cubes, slices or strands.
  - Most preservation processes involve more than one method for instance sun drying may be combined with salting, smoking with salting.
  - Drying can be done directly in the sun or using electric machines. However, drying also occur during grilling and roasting.
  - Fish is highly perishable and preservation process should be within 24 hours if not consumed in the fresh form.



## Transportation and packaging of meat

Transportation of meat from site of slaughter to place of sale and to place of consumption should be hygienic and economical. Contamination and spoilage during transportation should be prevented. Various modes of transport are used for meat transport. Mode of transport depends on affordability, availability, access roads, distance to be covered, amount of meat to be carried, and other factors.

### Modes of transportation of meat

- Pick-up trucks
- Motorcycle
- Donkey carts
- Wheelbarrows
- Small vehicles
- Lorries
- Boats
- Ship
- Plane.





Contamination and spoilage during transportation is further prevented through: -

- Use of transportation containers such as meat boxes, meat crates, fish crates.
- Include preservation methods such as freezing/refrigerated trucks during transportation.
- Meat transportation containers should be washed thoroughly and frequently.

### **Packaging of meat**

Proper packaging of meat is important to prevent contamination while carrying meat from the butchery, shops or other point of pick to home (or to the restaurant for cooking). The meat should be protected from dust, flies and other materials that may introduce microorganisms and or bad odour.

Types of packaging of meat: -



Polythene packing bags



Paper wrapping – usually used as second cover over polythene packing bag



Suitable stainless steel containers can be used for carrying meat



Canning – done by more specialized slaughter companies

## Meat Inspection

Common animals slaughtered for meats in South Sudan are cattle, goats and sheep. Chicken, fish and wild game meat are also commonly consumed in households. The immediate objectives of meat inspection are two: -

1. To ensure that only healthy animals are slaughtered for human consumption. Animals that show any sign of sickness do not proceed to slaughter.
2. To ensure that after slaughter, only meat that is free from any disease is passed for human consumption.

The process of meat inspection is organized into two main stages: -

Stage 1: Ante-mortem inspection of animals before slaughter



Stage 2: Post-mortem inspection of carcasses



## Ante-mortem inspection of ruminants: -

Check for temperature, gait, posture, color, smell, respiration, behavior, shape, discharges from the body openings and mucus membranes.



Abnormal behavior include

- Walking in circles, abnormal gait or abnormal posture, lameness, recumbence
- Head pressing against a wall/ objects
- Charging at various objects and acting aggressively.

Abnormal discharges include

- Discharges from the nose, excessive saliva from the mouth, from the vulva, anus, ears and eyes
- Blood, diarrhea, mucus, pus, excess tears and gut contents.

Abnormalities in shape

- Swellings (abscesses) commonly seen in swine
- Enlarged joints
- Umbilical swelling (hernia or inflammation of the navel)
- Enlarged sensitive udder indicative of mastitis.

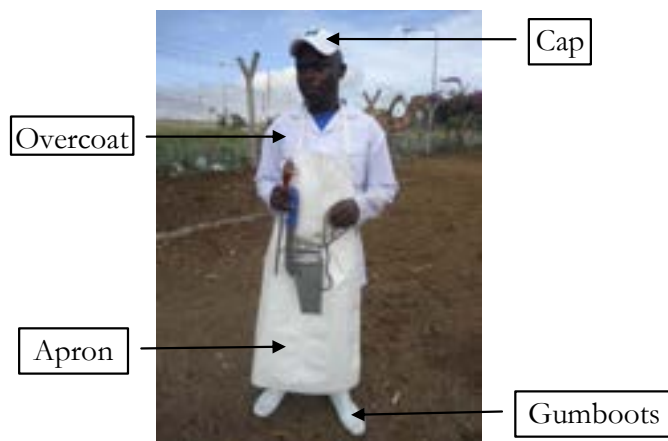
## Post-mortem inspection

Inspection is done by: -

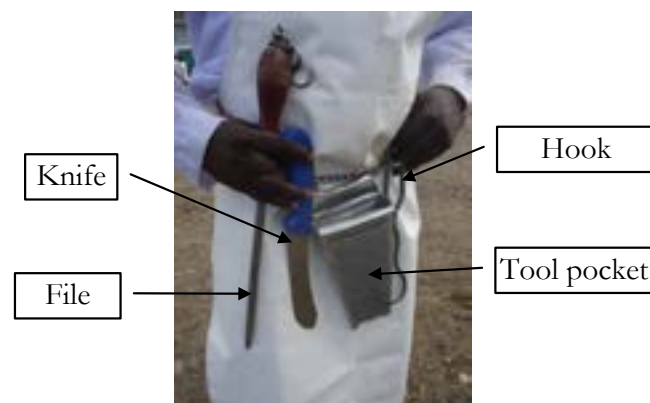
- A) Direct general observation – Using the eyes, check for swellings, color, cysts, hemorrhages, pus, edema, parasites and other physical changes and or injuries.
- B) Palpation - Touch and feel by hand and fingers to check for swellings and consistency.
- C) Slicing/ Incisions – Make cuts with sharp knife and check exposed surface for pus, color changes, cysts, hemorrhages, edema, and objects.
- D) Laboratory examination – This is done when suspect disease condition(s) is detected, and regularly at specific routine intervals, depending on prevalence of specific disease conditions.

Proper attire, tools and equipments are required for post mortem inspection.

### Proper attire



### Tools

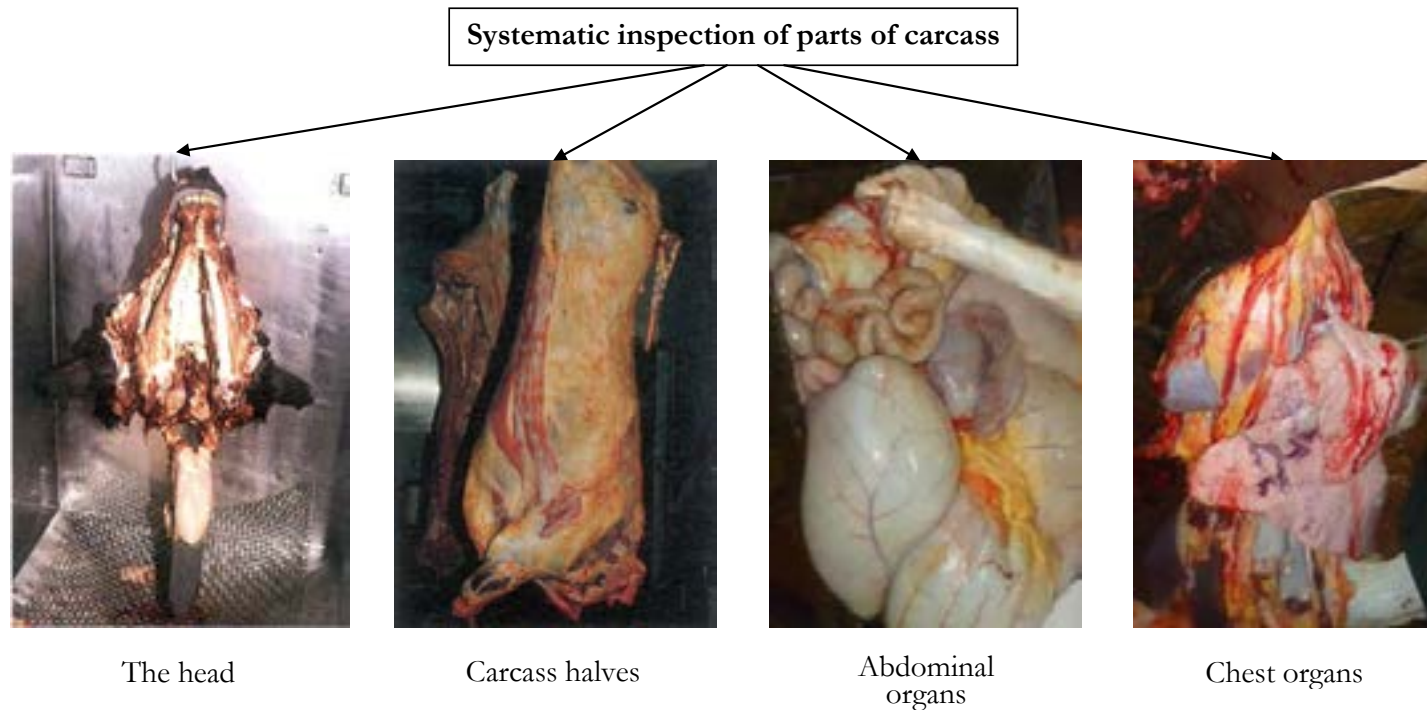




The attire should preferably be white so that it is easy to assess unhygienic change. Laboratory examinations require laboratory equipment such as microscope and many others materials and chemicals. Post mortem inspection of meat is done systematically on parts of the carcass by qualified / approved and licensed meat inspectors.

### Post-mortem inspection of ruminant meat

The systematic post mortem inspection of ruminant meat is organized into inspection of the head, carcass halves, abdominal organs and of chest organs.



## Inspection of the head



1. Conduct a general observation on the jaw muscles, tongue, mucus membranes, gums, lymph nodes and other structures.



2. Check the major jaw muscles. Make sharp incision on the muscles and check for cysts, hemorrhages, abscesses and other abnormalities.



3. Check head lymph nodes. Observe, palpate and make sharp incision. Check for size, cysts, hemorrhages, pus, edema and other abnormalities.



4. Check tongue. Observe, palpate and make sharp incision. Check for consistency, cysts, hemorrhages, abscesses and other abnormalities.

## Inspection of the carcass halves

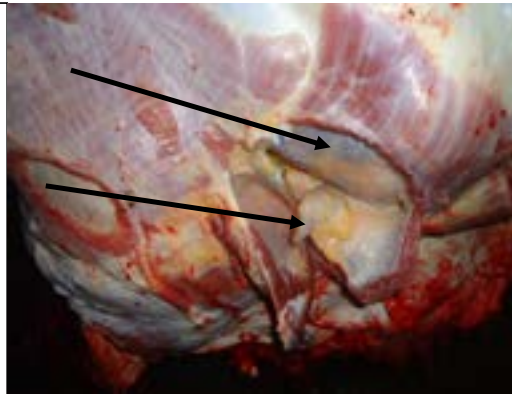


1. Conduct a general observation on both carcass halves. Check for abnormal swellings, hemorrhages, pus, signs of bruising, foreign objects, and other abnormalities.

2. Make sharp incisions on the main muscles (biceps, triceps, shoulder muscles, back muscles) and check for cysts, color and consistency.



3. Check the lymph nodes - Check for size, color. Make incision and check for color, hemorrhages, pus, edema and other abnormalities.





## Inspection of organs of the thoracic cavity

### The heart, cover and attachments



Check color, consistency, size, shape, surface, fluid accumulation. Make double slicing on heart wall and check for cysts, pus, color changes, thickness of wall, abscesses and other abnormalities.

### The lungs, trachea and attachments



Check color, consistency, size and shape. Check for hemorrhages, adhesions and abscesses. Make double slicing and continue checking. Check for frothing, cysts, worms and other abnormalities.

### Lymph nodes of the thoracic cavity

Check color, consistency, size and shape. Check for hemorrhages, edema, pus and other abnormalities.



Slice the lymph nodes and check for edema, pus, hemorrhages.

## Inspection of organs of the abdominal cavity



Check the omentum – color, consistency, size and shape. Check for hemorrhages, adhesions, cysts and abscesses.



Check the intestines, stomachs and rectum – observe the surfaces, attachments, color, size and shape. Check for hemorrhages, adhesions and abscesses. Check for cysts. Carefully make opening and check for worms.



Check the liver, kidneys and spleen – observe the surfaces, attachments, color, size and shape. Check for hemorrhages, adhesions and abscesses. Check for cysts. Make incision and check for hemorrhages, edema, pus and other abnormalities.

**Actions during inspection**

<b>Finding of inspection</b>	<b>Action to take</b>
Animals that die at ante-mortem inspection yard	<ul style="list-style-type: none"> <li>– Emergency inspection.</li> <li>– If infection(s) is suspected, carcass should be condemned and disposed off.</li> <li>– If anthrax is suspected, the slaughter place should be shut off, animals in contact should be quarantined and the slaughter place cleaned and disinfected thoroughly.</li> </ul>
Animals with signs of fever, difficult breathing and dullness	<ul style="list-style-type: none"> <li>– Animal should be isolated in the “sick yard” and further tests carried out. Treatment should be done according to diagnosis.</li> </ul>
Bruised skin at ante-mortem	<ul style="list-style-type: none"> <li>– Emergency slaughter of affected animals.</li> <li>– Bruised parts should be trimmed off, condemned and disposed off.</li> <li>– If bruising is too extensive, further laboratory tests should be done.</li> </ul>
Fractures	<ul style="list-style-type: none"> <li>– As above</li> </ul>
Tapeworm cysts	<ul style="list-style-type: none"> <li>– 1 – 5 cysts; Carcass should be chilled in at least 10°C, for 10 to 14 days then released for sale to any buyer in advance slaughter facilities</li> <li>– 6 – 20 cysts; Carcass should be chilled in at least 10°C, for 10 to 14 days but during cooking, carcass should be boiled thoroughly. Carcass should only be released to buyers who will ensure this – such as institutions.</li> <li>– Over 20 cysts; The carcass should be condemned in whole and disposed off.</li> </ul>
Liver flukes	<ul style="list-style-type: none"> <li>– Remove flukes if there is no damage to structure of liver.</li> <li>– If there are changes in consistency, trim off affected parts and dispose off.</li> </ul>
Gall stones	<ul style="list-style-type: none"> <li>– Trim off affected parts and dispose off.</li> </ul>
Swelling, hemorrhages, edema and pus in lymph nodes, spleen and kidneys	<ul style="list-style-type: none"> <li>– Carcass should be investigated for infectious diseases.</li> </ul>
Abscesses	<ul style="list-style-type: none"> <li>– Carcass should be investigated for infectious diseases.</li> </ul>
No Abnormalities	<ul style="list-style-type: none"> <li>– Pass whole carcass and organs as fit for human consumption.</li> <li>– Parts passed as fit for human consumption should be marked/ labeled so that it is possible to detect uninspected meat. Usually rubber stamp is used. Ink used in the rubber stamp should be non toxic.</li> </ul>

## Inspection of fish

The systematic process of inspection of fish involves: -

- A) Evaluation of the external surface and general body condition.
- B) Inspection of the gills.
- C) Inspection of the abdominal cavity.
- D) Inspection of the muscles.

### External surface and general body condition



Observe the general body condition of the fish - check shape, symmetry, color and other abnormalities.  
Note the general odor (smell)  
Examine the skin – check for color, contour, smoothness, injuries, hemorrhages, discharges and other abnormalities.

Different species of fish have different shapes. Depending on the species of fish, good fish should be in normal symmetry. Changes in shape and swellings indicate spoilage.



Examine the scales for attachment – in good fish scales are firm, while in stale fish, they easily detach or are already detached in very stale fish.



Check mucus on the skin for fluidity and color – in good fish mucus is transparent and clear in color, while slimy and cloudy in stale fish.

When the skin of fish is touched with a finger, slimy mucus leaves ropey strand between finger and skin of fish while in good fish, the ropeyness is less.



Check the eyes – they are convex (bulging) and clear in good fish, while in stale fish is flat, concave (sunken), cloudy, grey or rotten.  
Check the oral cavity for abnormal content, discharges, hemorrhages, and other abnormalities.  
Check the anus for hemorrhages, injuries, and other abnormalities.



### Inspection of the gills



Examine the gills – check for color, hemorrhages, presence of mucus, foreign bodies and other abnormalities. The gills are bright red / pinkish in good fish and no mucus. In stale fish, there may be clear, cloudy or milky mucus in the gills. Hemorrhages may indicate injuries.

## Inspection of the abdominal cavity



Open the abdominal cavity by cutting ventrally through the pectoral girdle. Extend this cut along the ventral midline from the gills to the anus and expose the body organs (heart, liver, intestines, spleen, gonads, and swim bladder) for examination.

Check for hemorrhages, adhesions, attachments, color, shape, size, injuries, foreign bodies and other abnormalities.



Check both the anterior and posterior kidney in fish that have these. In fish with fused kidneys, ensure that anterior and posterior sections are examined.



Ensure that the red gas-forming organ is present. Finally, open the stomach and intestines and examine contents for worms, food material.

## Inspection of the muscles



Observe the flesh - check for injuries and discharges. Make sharp incision and check for cysts and color. The flesh is translucent and shiny in good fish. The direction of incision should correspond to the direction preferred in subsequent processing.

Inspection of other fish species follows similar process. Further inspection involves collection of samples for laboratory tests.

Fish meat with signs of spoilage should be condemned.



## Inspection of other meats

Inspection of poultry, rabbits and other meats follow similar principles as for ruminants. However, the anatomical structures, disease conditions and spoilage vary to some extent.

### Poultry

- Check for clinical conditions at ante-mortem inspection – gait, feathers, respiration, and symmetry of body, size of body parts and behavior of the bird.
- Post-mortem inspection should be systematic. All organs should be checked for color, size, shape, hemorrhages, edema and presence of foreign objects.



## PART TWO: MILK HYGIENE



## Milk Hygiene

Unhygienic milk may cause disease to humans either by transmitting disease from livestock to human or from environment to human. Common zoonotic diseases that can be transmitted from livestock to man through consumption of infected milk are Brucellosis and Tuberculosis. Common food contamination disease conditions from unhygienic milk are Salmonellosis, Influenza and Enteritis due to **E. coli**. During outbreak of Cholera, transmission from person to person can occur through unhygienic milk.

### Brucellosis

Signs of Brucellosis in animals and human are discussed in the section on meat hygiene.

#### Transmission of Brucellosis from animals to human, through milk



Through  
consumption of  
unboiled milk



Through direct suckling of milk  
from the teat of an animal

- Other ways of transmission are through contact of blood and opening on skin of a person during handling of meat of an infected animal. This is discussed under section on meat hygiene. Slaughter place workers, butchers, and persons preparing meat for cooking are at risk of infection by skin contact.

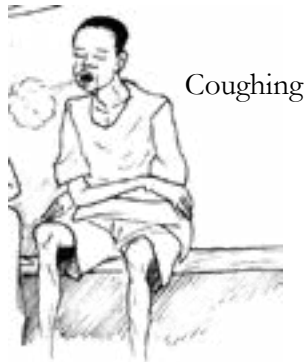
### Milk hygiene practices to reduce Brucellosis

- Milk should be boiled properly before consumption.
- Never suckle milk directly from the teats. Children should be warned never to suckle directly from the teats of a goat, sheep or cow.

## Tuberculosis

Zoonotic tuberculosis is caused by *Mycobacterium bovis*. The condition is referred to as bovine tuberculosis while tuberculosis caused by *M. tuberculosis* is human tuberculosis. Tuberculosis mainly affects lungs and lymph nodes.

### Signs of bovine Tuberculosis in human



Breathing difficulties

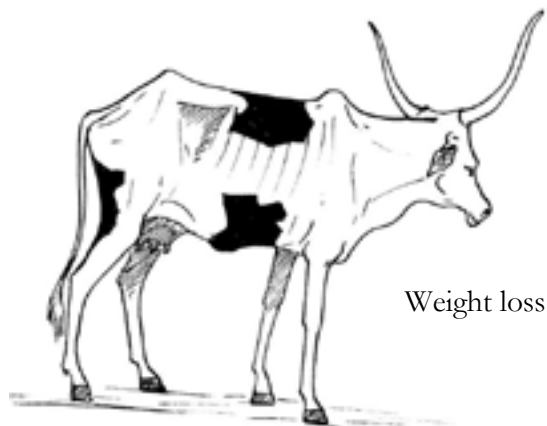


Emaciation

Extra-pulmonary signs of fever, sweating at night and weight loss occur in children



## Signs of Tuberculosis in cattle



Weight loss



Anemia – mucus membranes of vulva, of gums and of eye are pale



Enlarged lymph nodes



At post-mortem, hemorrhages on peritoneal surfaces and pus in lymph nodes



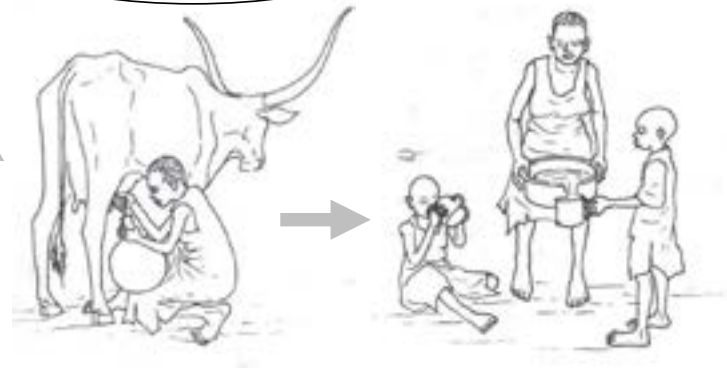
At post-mortem, the spleen is enlarged

## Transmission of Tuberculosis

Cattle contract TB from cough droplets of other sick cattle



Consumption of unboiled milk or dairy products made from unboiled milk



Tuberculosis can also spread from cattle to human through inhalation of exhaled particles from cattle and through contact of infected carcass with wounds on handlers of meat and hides. These modes of spread are, however, very rare.

## Risk factors for infection by Tuberculosis

- Consumption of milk that is not boiled or dairy products prepared from milk that is not boiled.

## Prevention and control of Tuberculosis



Heating/pasteurization  
of milk

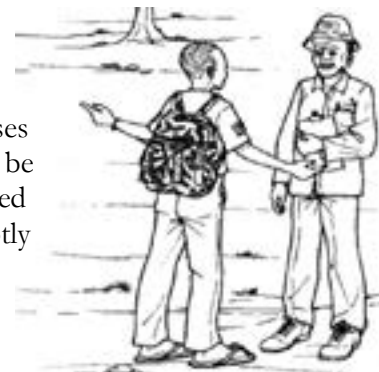


Vaccination  
of babies  
protects  
them  
during their  
life

Treatment of  
tuberculosis in  
cattle is NOT  
effective. Cattle  
with TB should  
be eliminated



TB cases  
should be  
reported  
promptly



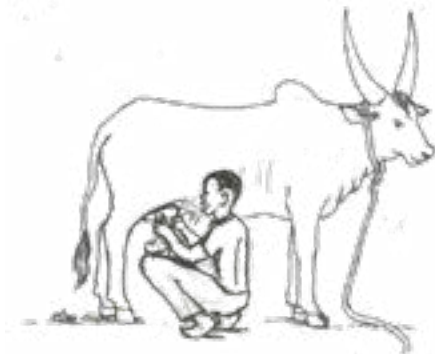


## Milk contamination and spoilage

Contamination of milk occurs when dirty material contacts milk and introduce micro-organisms that cause disease to consumers and spoilage of milk. Milk spoilage occurs when milk is contaminated and changes from safe milk to a form that is unsuitable for human consumption. Signs of milk spoilage are change in color, consistency and bad odors.

### Sources of contamination and spoilage of milk

- Dirty milking place.
- Dirty milk handlers – milker, transporter, traders and consumer.
- Dirty milk handling containers, utensils and materials.
- Dirty milk selling stalls.
- Dirty animal.
- Dirty packaging.
- Dirty kitchen.
- Spoilage of milk can be caused by other physical bodies that change it into form that is unsuitable for human consumption.





## Consequences of contaminated and spoilt milk

- Contaminated and spoilt milk can cause diseases to human – Cholera, Influenza (Common cold), E-coli enteritis
- Economic loss – Milk cannot be sold.

## Prevention of contamination and spoilage of milk

- Proper hygiene - Hygiene of containers, utensils, materials for milk handling, milking place, milk handlers, of the animal, milk stalls, kitchen, kitchen utensils and hygienic packaging.
- Proper milking place.
- Proper milk selling stalls.
- Proper containers, utensils and materials for milk handling – the containers, utensils and materials should be easy to clean. Aluminium and stainless steel containers are preferred.
- Proper attire for milk handlers – over coat, overalls, head cap/hood, gumboots and apron.
- Proper milking procedures.
- Milk preservation.



**Milking bucket**



**Milk scoops**

Other utensils and materials for hygienic handling of milk are sieve, strainer cloth, hand towel, and milk can.

## Methods of milk preservation



Boiling/pasteurization

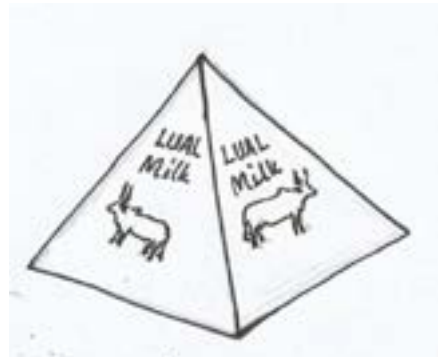
Boiling involves heating of milk for 10 to 40 minutes. Boiling should be in a water bath to prevent formation of burnt particles that form burnt off flavor.

In large-scale dairies and processing plants, milk is preserved through the process of pasteurization. Pasteurization is done by heating milk to 63°C for 30 minutes or at 72°C for 15 seconds and then immediately cooling it to refrigeration temperature (less than 4°C).

Heating of milk through boiling and pasteurization kills micro-organisms that can cause diseases and milk spoilage.



Cooling or chilling - slows growth of micro-organisms



Packaging - reduces contamination from external environment

Fermentation and other products such as ghee, butter, cheese and powdered milk are processed forms of milk that can be preserved for long periods.

## Transportation and packaging of milk

Various modes of transport are used for transporting milk. Mode of transport used depends on affordability, availability, access roads, distance to be covered, amount of milk to be carried, and other factors. Contamination and spoilage during transportation should be prevented. Transportation of milk from place of production to site of sale and of consumption should be hygienic and economical.

### Modes of transportation of milk

- Motorcycle
- Pick-up trucks
- Lorries
- Tractors
- Small vehicles
- Donkey carts
- Bicycle
- Boats
- On foot.

Appropriate mode of transport mainly depends on volume of milk to be transported, access routes and affordability.

Contamination and spoilage of milk during transportation is prevented through: -

- Use of transportation containers such as milk cans, crates and chilled compartments.
- Transportation containers should be washed thoroughly and frequently.



1 ton pickup truck with milk cans



Motorcycle with milk cans

### Milk transportation containers



Milk cans

Milk cans should be easy to clean. Aluminium or stainless steel cans are preferable. Aluminium cans are light hence easier to manipulate. Milk cans may be 3, 5, 10, 15, 30 or 50 liters. Smaller ones are suitable for use at home while larger ones are suitable for commercial operations.

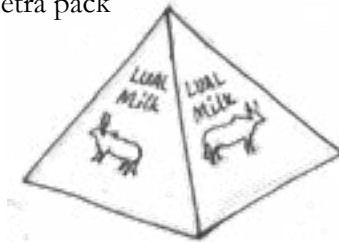


Crates are suitable for packaged milk

### Milk packaging

Packaging minimizes contamination and spoilage of milk. Types of packaging include: -

Tetra pack



Sachet



## PART THREE: RABIES



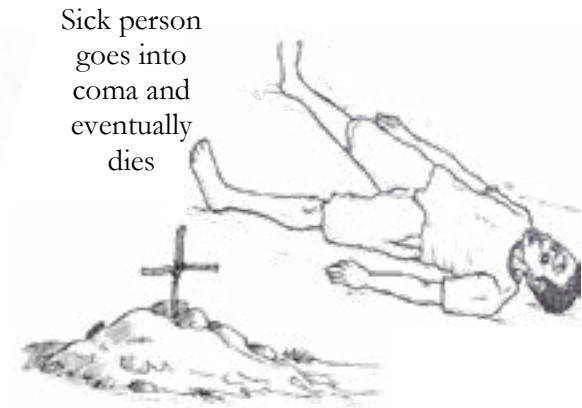
## Rabies

Rabies is a deadly zoonotic disease transmitted through bites of infected dogs, cats, bats, wild foxes, squirrels, horses, cattle, monkeys and other animals. The saliva of infected animals is highly infective if it comes into contact with wound.

### Signs of Rabies in human

Signs appear in 1 to 3 weeks but can also be from as early 1 week to as late as 1 year.

Signs begin with fever and usually pain and an unusual burning sensation at the wound site. Later, signs of interference with brain and spinal cord appear.

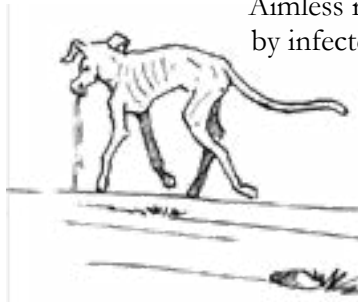


## Signs of Rabies in dogs

Excessive salivation, loss of appetite, difficulty in swallowing



Aimless roaming by infected dogs



Continuous barking



Rabid dog attacks people, animals and objects



Dullness, paralysis and finally death

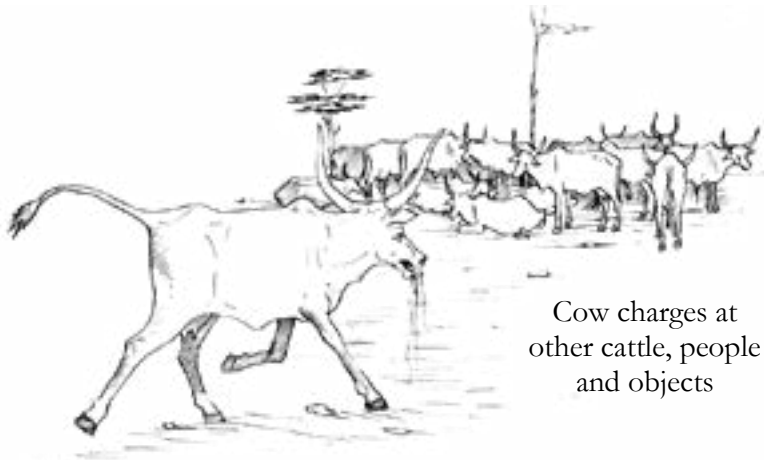


## Signs of Rabies in cattle

Initially  
dull then  
develops  
excessive  
salivation



Animal soon  
develop irritability  
then signs of  
madness; head  
pressing against  
objects



Cow charges at  
other cattle, people  
and objects



Sick animals eventually die



## Transmission of Rabies



Infection through  
bite of rabid dogs



Saliva of infected dogs is infective  
when sick dog leak wounds



Dogs become infected through  
bite of sick dogs such as while  
fighting each other

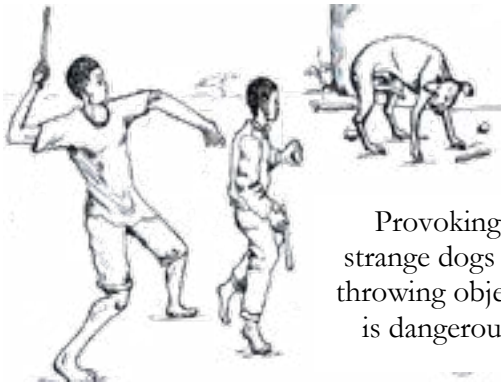


Wild carnivores such as the  
fox spread rabies to dogs  
through bites

Rabies can be transmitted from the  
following other animals: -

- Cats
- Squirrels
- Cattle
- Horses
- Monkeys.
- Bats –mainly the west

### Risk factors for infection with rabies



Provoking  
strange dogs by  
throwing objects  
is dangerous



Handling of dogs and cats without use of proper restraint materials.  
The chain and muzzle are useful restraint items for handling dogs



Poorly discarded carcasses and slaughter waste attract dogs and wild  
carnivores resulting into fights among that spread rabies to dogs

## Prevention and control of rabies

- Dogs that show signs of rabies should be killed immediately. Report suspected rabid dogs to authorities / veterinary services immediately.
- In areas where rabies is endemic, dog population should be vaccinated routinely and tagged for ease of identification.
- Never throw sticks, stones or other objects at strange dogs.
- Wash dog bite wounds thoroughly with water and soap or detergent, then apply disinfectant such as iodine.
- Carcasses should be disposed off safely and away from reach of dogs, cats and other scavengers.
- Animal health workers should ensure proper restrain of dogs and cats during handling.
- Animal health workers should preferably receive routine vaccination against rabies



Dogs should be properly restrained with muzzle and chain during handling



Seek medical attention immediately. Rabies kills!

**There is no treatment against rabies for infected animals!**



- Infected animals die within 10 days after onset of signs.
- Before death, they can infect other animals and people through bites or saliva.



Report rabid dogs to the authorities immediately.

Rabid dogs should be killed to avoid further transmission.



In rabies-endemic areas dogs should be vaccinated against the disease



Cattle should be vaccinated in case of outbreaks in an area

### Be kind and sensitive to dogs

- Do not run or move provocatively near dogs.
- If a nervous or growling dog gets close to you, stay still, look only at the ground, walk backwards slowly, do not turn and run.



Avoid looking directly into the eyes of a dog

Never disturb a dog that is resting, sleeping, caring for puppies or eating



## Other human disease conditions associated with dogs and cats

### Jiggers and fleas

Jiggers and fleas infest animals and human. There are several species of jiggers and fleas.

#### Signs of Jiggers in human

Single or more swellings  
on toes, fingers, knees  
or other skin folds



Itching



Small white particles  
on toes, fingers



Swollen,  
oily toes

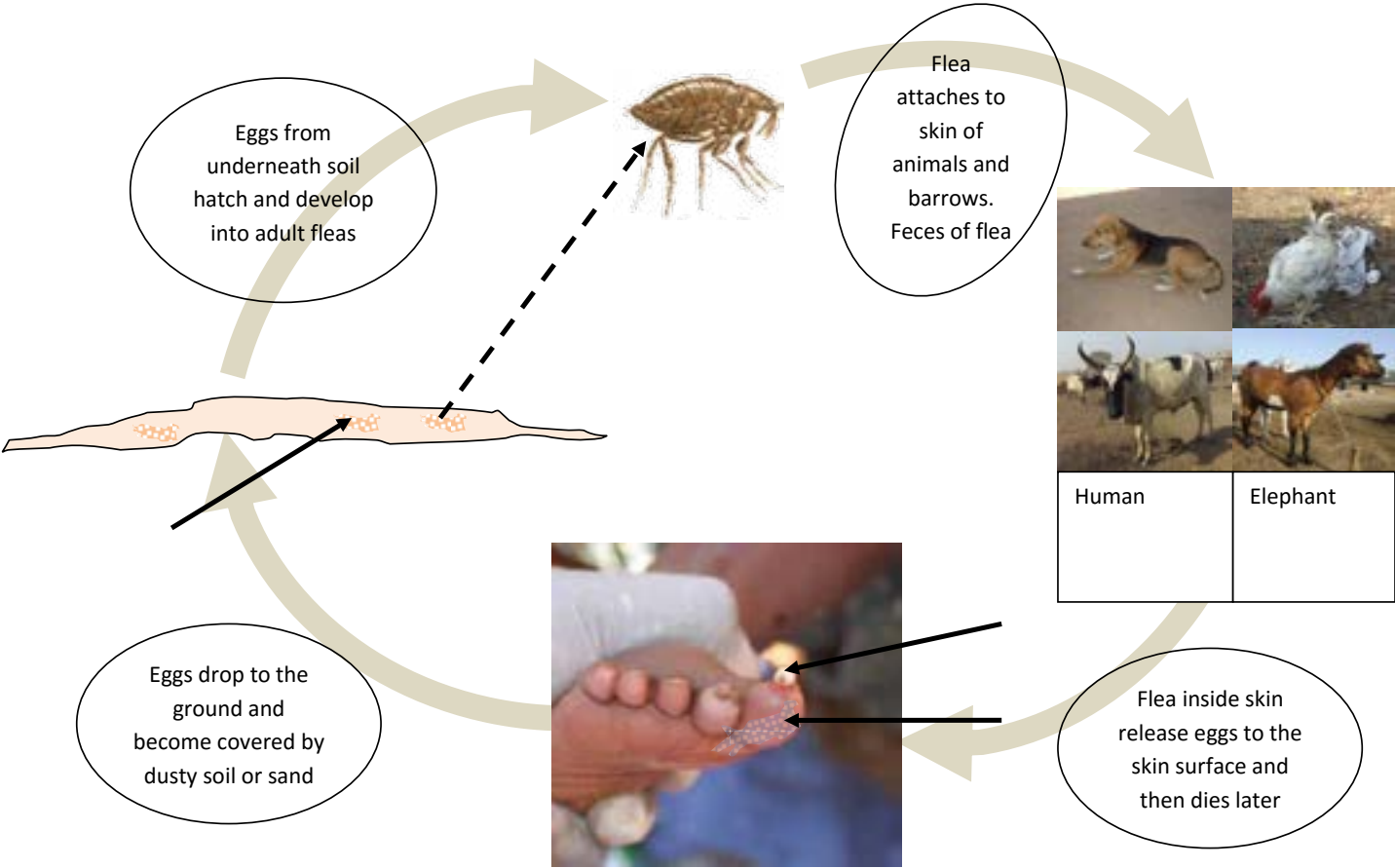
Pain

Difficulty in  
walking

Infestation in human is associated with poor hygiene. In animals signs of fleas infestation are scratching and skin reactions.



Infestation cycle of Jiggers



### **Risk factors for infestation with jiggers and fleas**

- Poor personal hygiene
- Poor hygiene of shelter
- Dusty house
- Dusty compound.

### **Prevention and control of jiggers and fleas**

- Sweep dust from house and compounds
- Sprinkle water on cleaned dusty ground
- Ensure proper personal hygiene
- Affected people should seek treatment immediately
- Proper control of external parasites on livestock, dogs, cats and other pets.

Sweep dust from house and compounds and sprinkle water frequently



Prevent infestation of jiggers by ensuring proper personal hygiene



## Toxoplasmosis

Toxoplasmosis is the infestation with parasites of *Toxoplasma gondii*. The condition affect cats, human, sheep, goats, pigs, cattle, rodents, birds that feed on the ground and lizards. In both cats and human, infestation occurs without clinical signs in normal individuals. Signs develop in individuals with depressed immunity.

### Signs of Toxoplasmosis in human

Signs commonly develop in individuals with depressed immunity such as HIV/AIDS patients and infants. The signs are: -

- Fever
- Weakness and tiredness
- Sweating at night
- Muscle pains
- Sore throat
- Ocular signs
- Pneumonia
- Nervous signs
- No signs in pregnant women but they pass parasite to fetus.
- After birth, signs in infants that became infected in pregnancy are loss of vision, mental retardation, loss of hearing, and death in severe cases.

### Signs of Toxoplasmosis in cats

- Fever
- Loss of appetite
- Weaknesses
- Pneumonia if lungs are affected
- Nervous signs if brain is affected – cycling, head pressing and seizures
- Difficulty in chewing and difficulty in swallowing
- Blindness.

## Transmission of Toxoplasmosis

Contact with contaminated soil is the major means by which many different species—rodents, ground-feeding birds, sheep, goats, pigs, and cattle, as well as humans are exposed to the parasite. In addition, transmission to humans is due to eating under cooked infected meat, particularly lamb and pork. People also become infected by eating unwashed fruits and vegetables contaminated by feces of cats. *Toxoplasma* organisms can sometimes be present in unboiled/unpasteurized milk and dairy products, such as goat's milk. The parasite can also be transmitted directly from pregnant woman to unborn child when the mother becomes infected during pregnancy. Cats mainly become infected by eating lizards. Infected cats excrete parasites with feces.



Unwashed vegetable and fruits



Consumption of undercooked meat, especially lamb and pork



Unboiled/unpasteurized milk and dairy products from infested goats

### **Risk factors for infection of Toxoplasmosis**

- Poor domestic hygiene – cat feces may contaminate kitchen utensils, vegetable, fruits, hands of handlers or consumers.
- Staying with cats which hunt outside of house.
- Staying with cats which feed on raw/uncooked meat.
- Consumption of unboiled/unpasteurized milk or dairy products.

### **Prevention and control of Toxoplasmosis**

- Do not eat raw or under cooked meat.
- Do not drink unpasteurized milk.
- Do not eat unwashed fruits and vegetables.
- Wash hands and food preparation surfaces with warm soapy water after handling raw meat.
- Wash hands before eating (especially for children).
- Do not drink water from the environment unless it is boiled.
- Do not feed raw meat or under cooked meat to cats. Also, do not give them unpasteurized milk.
- Do not allow cats to hunt or roam.
- Do not allow cats to use a garden or children's play area as their site.
- Pregnant women, and persons with suppressed immune systems, should not clean litter sites of cats.
- Control rodent populations and other potential intermediate hosts.

## PART FOUR: ZOONOSES ASSOCIATED WITH INSECTS

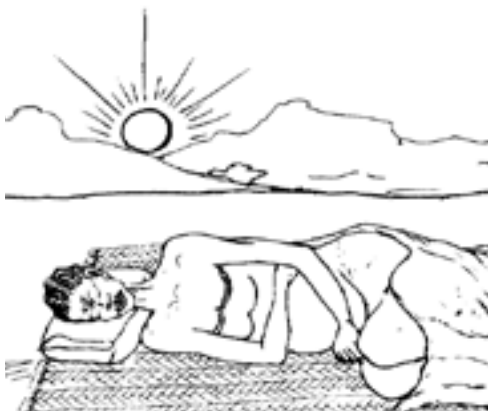


## Zoonoses Associated with Insects

### Trypanosomiasis

Trypanosomiasis are diseases (Trypanosomoses) caused by Trypanosome blood parasites. In Eastern Africa, zoonotic Trypanosomiasis (Sleeping sickness) is caused by *Trypanosoma rhodesiense*. The other form of zoonotic Trypanosomiasis occurs in West Africa and is caused by *Trypanosoma gambiense*. In animals, zoonotic Trypanosomiasis in Eastern Africa occurs in Cattle, antelopes and other wild ruminants of cloven hooves. Other species of Trypanosomes infect and cause disease in cattle, sheep, goats, dogs, cats, horses, camels and other wild animals but are not zoonotic.

### Signs of Trypanosomiasis in human



Affected person continuously feel sleepy, and tends to sleep most of the day hence the name **Sleeping sickness**



Affected person frequently nodes off into sleep even when sitting



Without treatment, sick person eventually die

## Signs of Trypanosomiasis in animals



Weight loss in cattle



Loss of tail hair



Swollen lymph nodes

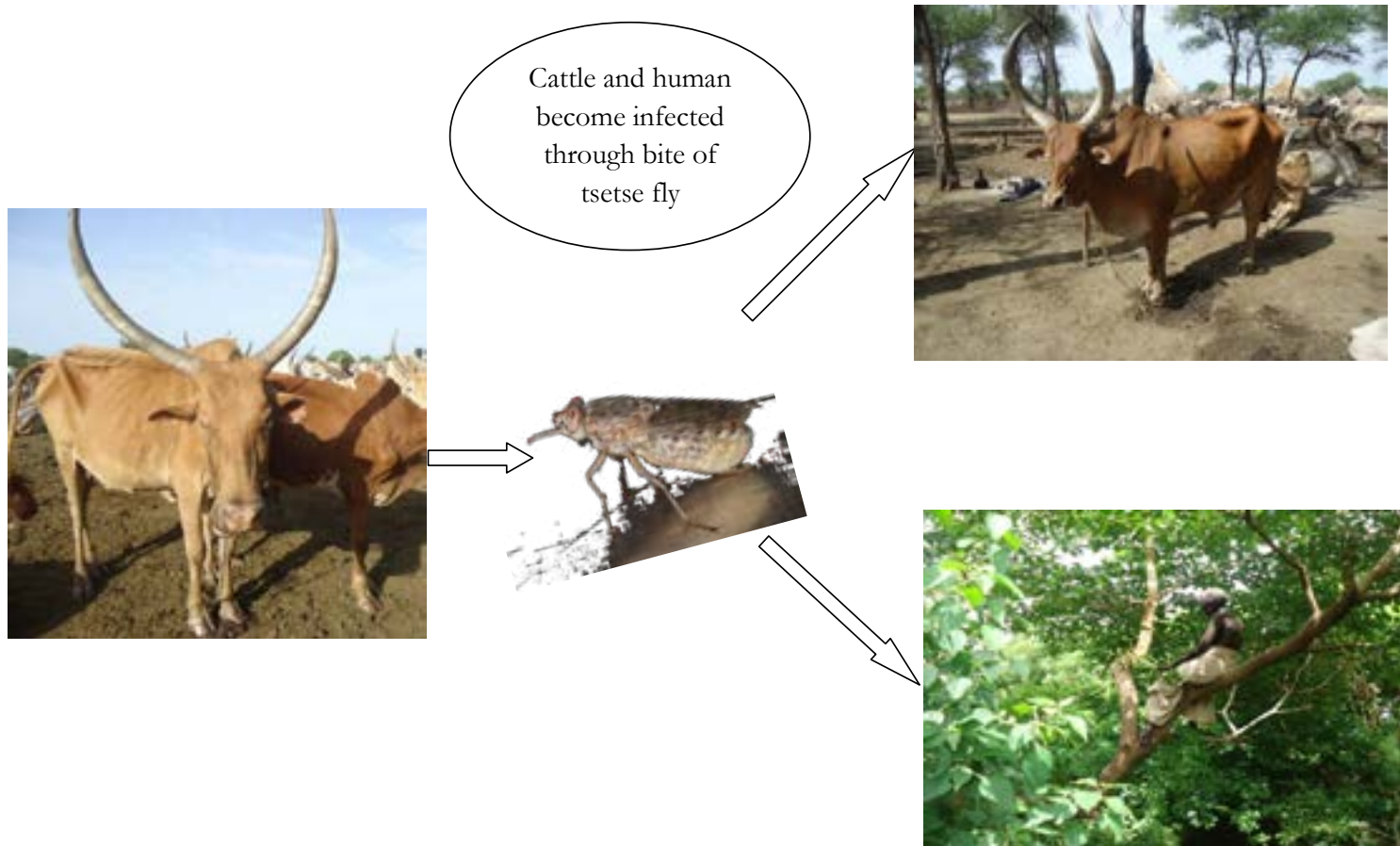


Pale mucus membranes; of vulva, gums and eye are pale

Other signs in cattle are: -

- Tears flow from the eyes
- Loss of appetite
- Reduced milk production
- Rough hair
- Weakness
- Dullness.

## Transmission of Trypanosomiasis





### **Risk factors for infection by Trypanosomiasis**

- People who go to the bush to cut wood and grass are more at risk
- Hunters are exposed to infection due to high association with bush and woodlands
- *Trypanosoma rhodesiense* is common in dry bush and woodland.

### **Prevention and control of Trypanosomiasis**

- Seek medical attention immediately when sick
- Avoid bites of tsetse fly
- In livestock use of insect repellents such as pyrethrins including pour-ons help keep flies away.

## Rift Valley Fever

Rift Valley Fever (RVF) is a viral disease caused by the Rift Valley Fever virus. The virus was first identified in 1931 during an investigation into an epidemic among sheep on a farm in the Rift Valley of Kenya.

### Signs of Rift Valley Fever (RVF) in human

In human, RVF can be in mild form or severe form. Mild signs occur in about 96% of human RVF cases while the severe form occurs in about 4% of human RVF cases.

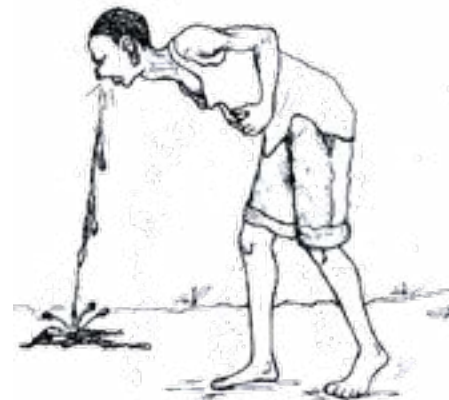
#### Mild form of RVF in human



Fever, chills, joint pains and headache



Stiffness of the neck in some patients. RVF in early stages may be mistaken for meningitis



Vomiting, loss of appetite and sensitivity to light

## Severe form of RVF in human

Severe form develops after mild form and shows as one, two or all of three syndromes: -

i)



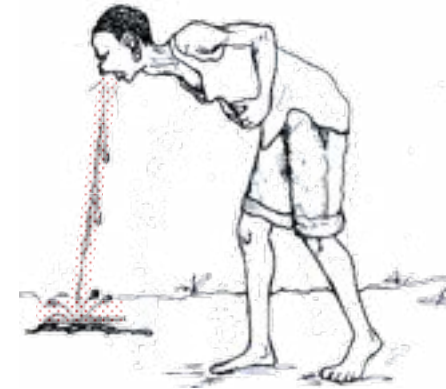
Ocular signs – blurred, decreased vision. Develop 1 – 3 weeks after mild signs. Eventually vision may or may not be lost completely. Death is rare, disease may resolve itself in 10 – 12 weeks

ii)



Meningo-encephalitis – loss of memory, intense headache, confusion, hallucinations, disorientation, convulsions, discoloration of skin, weakness and coma

iii)

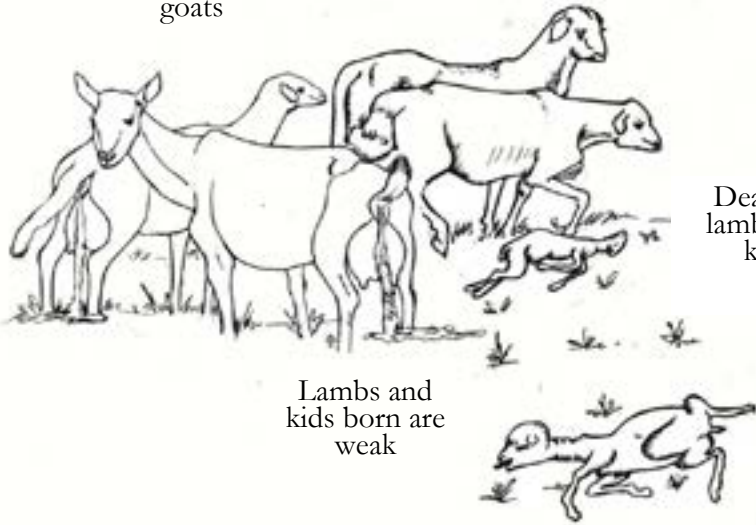


Hemorrhagic fever – Manifests as generalized hemorrhages in body tissues. Initially, jaundice (seen as yellow mucus membranes) occur. Then vomiting blood, passing blood in feces, bleeding from the nose and gums are seen, and in females, blood flow from the vulva is seen

Hemorrhagic fever develops 2 - 4 days after appearance of the first symptoms of mild form. Initial jaundice is indicative of severe liver damage. Death occurs in 50% of patients showing hemorrhagic signs. Death occurs 3 - 6 days after onset of hemorrhagic signs.

## Signs of Rift Valley Fever in animals

Abortions sheep and goats



Death of lambs and kids

Lambs and kids born are weak



Diarrhea

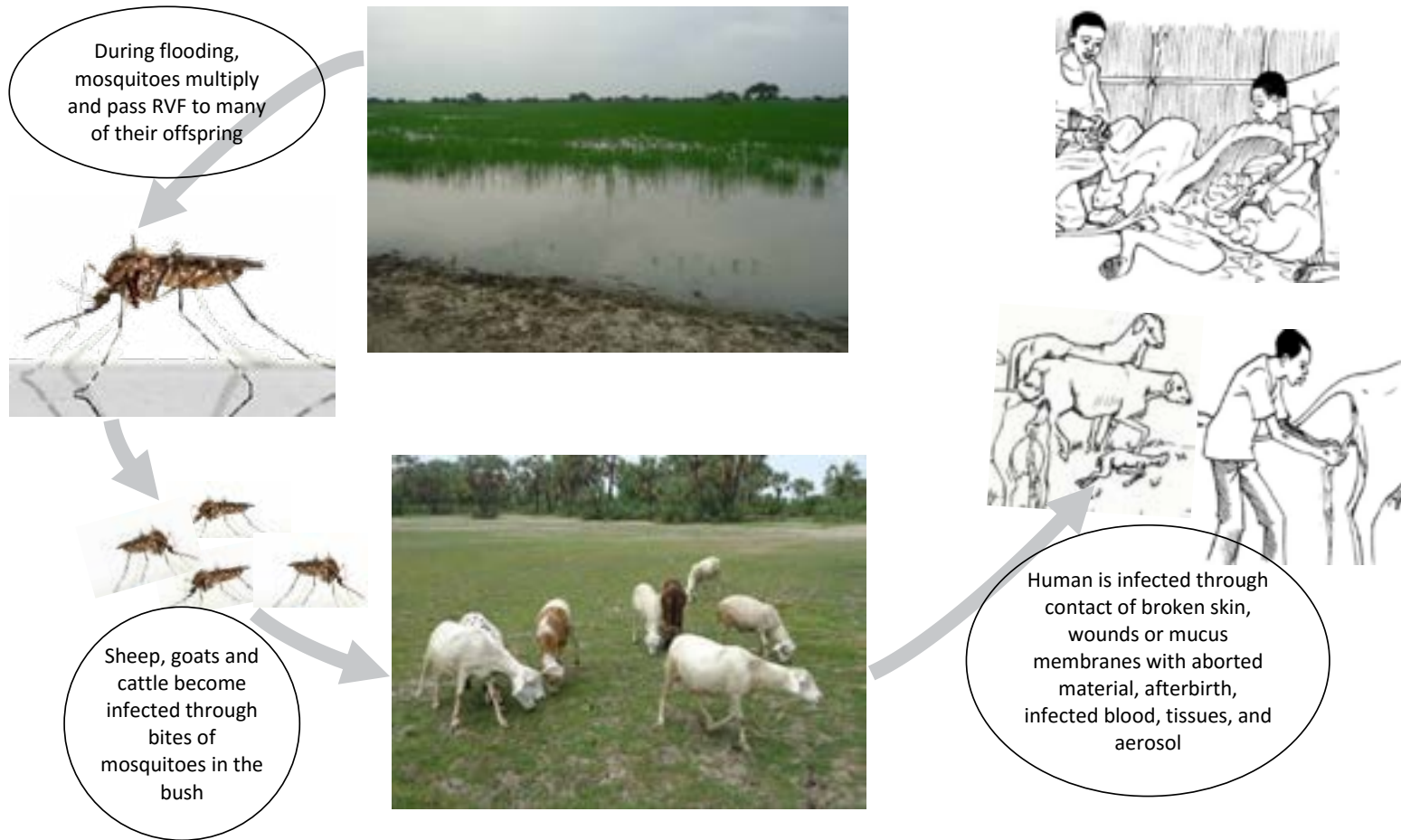


Bleeding from the nose



Retained placenta

## Transmission of Rift Valley Fever



- Transmission to human can also occur by consumption of unheated/unpasteurized milk that is obtained from infected sheep, goat or cattle. Mosquitoes, especially aedes, can transit RVF from infected sheep, goats and cattle to human through bites.

### **Risk factors for infection by Rift Valley Fever**

- Handling of aborted material such as placenta, aborted fetus and abortion discharges without protection.
- Slaughter of livestock which have recently had abortion.
- Cooking of meat of livestock which have recently had abortion.
- Livestock that sleep out of housing during floods.
- Consumption of unheated/unpasteurized milk or dairy products prepared from unheated/unpasteurized milk.

### **Who is at risk?**

- Livestock keepers
- Herders
- Slaughterhouse workers
- Veterinarians and other animal health workers.

### **Prevention and control of Rift Valley Fever**

- Housing of sheep and goats during flood periods.
- Avoid handling of aborted material without protection.
- Proper ante-mortem inspection of animals to identify sick cases.
- Vaccination of livestock when outbreaks are foreseen such as when heavy flooding is anticipated.
- Disease cases should be reported promptly.
- In suspected cases, the animals should not be handled without protective gloves.
- Meat should be thoroughly cooked before consumption.
- Milk should be properly heated/pasteurized before consumption.
- Movement of animals from zones of outbreak should be restricted and controlled.

## PART FIVE: FOOD SAFETY AND HYGIENE





## Food contamination and food poisoning

Food contamination occurs when food come into contact with disease pathogens from the surrounding environment such as food utensils, packaging material, dirty hands, tables, shelves of shops, shelves of food kiosks, people handing food, the garden, livestock and wild animals.

Disease pathogens that cause food contamination mainly exist in household wastes, human wastes, livestock wastes, wild animal wastes and other decomposing material. Common human disease conditions due to food contamination are Cholera, E-coli Enteritis, and Salmonellosis. Common cold (Influenza/common flu) is caused by a virus. Common cold disease condition result through contamination of food, food utensils, tools and equipment from nasal discharges, cough or saliva of sick people.

Food poisoning is the condition in which toxins from disease pathogens in food are consumed, causing disease on consumer. The disease pathogens release toxic poisons in the decomposing food and the toxins, when consumed cause disease. Common human disease condition due to food poisoning in meat is Botulism. Botulism is already discussed under section on Meat hygiene.

### Signs of common food contamination

Cholera, E. coli poisoning and Salmonellosis are all characterized by diarrhea, but general presentation in affected people are distinct.

In E. coli poisoning, the diarrhea eventually becomes bloody unlike in Cholera and Salmonellosis.

In cholera, abdominal pain and fever are rare.

Cattle with E. coli in their intestines rarely show any clinical signs. In calves, E. coli from cattle feces cause Navel ill in which the navel become inflamed and swollen. In most cases, affected calves have diarrhea.

## Comparison of clinical signs in human



### Diarrhea

- Severe and watery in Cholera
- Occurs in Salmonellosis
- In *E. coli* poisoning, soon progress into bloody diarrhea



### Vomiting

- Severe in Cholera
- Occurs in Salmonellosis
- Slight in *E. coli* poisoning



### Abdominal pain

- Severe in *E. coli* poisoning
- Occurs in Salmonellosis
- Rare in Cholera



### Fever

- Occurs in *E. coli* poisoning and in Salmonellosis
- Rare in Cholera



### Headache

- Occurs in *E. coli* poisoning
- Rare in Salmonellosis
- Absent in Cholera

Leg cramps occur in Cholera unlike in Salmonellosis and *E. coli* poisoning.

Table on comparison of clinical signs

<b>Food contamination disease condition</b>	<b>Onset of signs after exposure</b>	<b>Diarrhea</b>	<b>Vomiting</b>	<b>Abdominal pain</b>	<b>Fever</b>	<b>Nausea</b>	<b>Others</b>	<b>Complications in prolonged infection</b>
Cholera	2 – 3 days	Severe watery diarrhea	Severe	Rare	No	Yes	Leg cramps	- Death, usually in 24 hours, due to shock resulting from severe dehydration.
Salmonellosis	½ - 3 days	Yes	Yes	Yes	Yes	Yes	-	- Pus in tissues - Abscesses in tissues - Arthritis.
E. coli poisoning	2 – 5 days	Watery diarrhea progressing to bloody diarrhea	-	Cramps and abdominal pain	Fever and chills	Yes	Headache	- Kidney damage in 10% of patients - Damage of central nervous system - In most people, sickness resolves in 1 week.

The signs of common cold/influenza/common flu are sneezing, nasal discharges and cough.

### Transmission of common food contamination

Cholera, Salmonellosis and *E. coli* are mainly transmitted through contamination of foods, food utensils, food tools and food equipment by fecal material. Poor management of human and animal waste is primary factor in transmission of these diseases

Food contamination disease condition	Onset of signs after exposure	Main source of contamination and infection	Causative bacteria
Cholera	2 – 3 days	Feces from sick people contaminate food and water Usually result from poor management of human waste in combination with poor food hygiene, poor water sanitation.	<i>Vibrio cholerae</i>
Salmonellosis	½ - 3 days	Feces of infected people contaminate beef, poultry, milk, eggs, utensils, food preparation surfaces and tools Salmonella also occurs in feces of livestock, rodents reptiles – poultry become contaminated while feeding on ground Usually result from poor handling of food.	<i>Salmonella typhi</i> <i>S. paratyphi</i> <i>S. enteridis</i> <i>S. enterica</i>
E. coli	2 – 5 days	Mainly feces of cattle – contaminate meat during slaughter, Contamination of other foods, vegetable and fruits by cattle feces Feces of sick people In few cases, intestines of chicken, sheep, pigs and deer.	<i>Escherichia coli</i>

While Cholera is transmitted from contamination by human feces, *E. coli* and Salmonellosis are transmitted from contamination by human as well as animal feces. In E. coli poisoning and Salmonellosis, once infection moves from animal feces to infect human, spread of disease continue from person to person through human feces.

All the three conditions are associated with poor hygiene in handling of food and water and poor sanitation.

### **General risk factors for food contamination**

- Difficulties in accessing clean water – results into difficulties in washing hands as necessary, difficulties in washing food utensils, tools and equipment, poor personal hygiene and poor household hygiene.
- Inadequate and improper utensils, tools and equipment for food handling – improper tools and equipment for meat handling, improper utensils and equipment for milk handling.
- Inadequate boiling/undercooking and raw foods – milk and meat.
- Foods, utensils, tools and equipment handled by sick people.
- Poor control of livestock – hence contaminate food areas, then to food utensils, tools and equipment.
- Poor food handling procedures – when proper slaughter procedure is not observed, proper milking procedure is not observed, proper processing procedure for meat or milk are not observed.

### **Prevention of food contamination**

- Always wash hands,
  - i. Before eating
  - ii. Before beginning to handle foods
  - iii. After visiting the latrine or bathroom
  - iv. Before beginning to handle food utensils, food tools and food equipment.
- Properly constructed latrines/toilets should be used
- Wash food utensils, food tools and food equipment after use, dry (with clean cloth or on a rack in the sun) and store in clean place free of dust and dampness
- Milk and meat should be adequately heated/boiled before consumption
- Vegetable and fruits should be adequately washed before consumption or preparation for consumption

- The right and adequate utensils, tools, equipment and attire should be used for handling milk or meat
- Meat and milk handling places should be frequently cleaned
- Meat and milk handling places such as slaughter houses/abattoir/slabs, butcheries, milk bars, restaurants should be properly constructed
- Proper procedures should be followed for slaughter, milking and processing of food products
- Raw foods should never be mixed with ready-to-eat foods
- Wash hands between handling different food types
- Sick people should not handle food prepared for public consumption
- Always wash hands after handling animals or animals products
- Persons with suspect infections or conditions should seek medical attention immediately.

## PART SIX: POULTRY ZOONOSES





## Poultry Zoonoses

### Avian Influenza

Avian influenza is a zoonotic disease that affects birds, human, pigs and cats. Birds affected are chicken, guinea fowl, ducks, geese, turkey, quail and wild birds. It is caused by Avian influenza virus. Various strains of the virus H1N1, H2N2, H3N2, H5N1 are zoonotic.

#### Signs of Avian Influenza in human

- Fever & flu like illnesses – Nasal discharge, sneezing and coughing.
- Sore throat
- Muscles aches
- Eye infections
- Pneumonia
- Severe respiratory diseases
- Multi-organ system failure is common
- Death on 9<sup>th</sup> to 10<sup>th</sup> day after appearance of first signs.



## Signs of Avian Influenza in chicken and birds

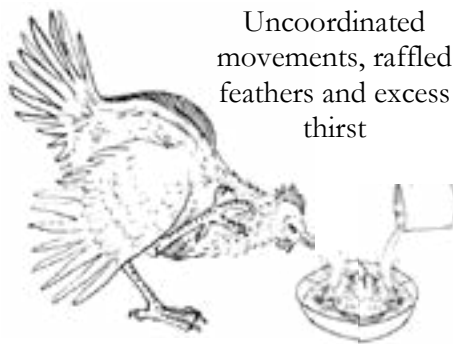
Signs in birds occur in either of two forms: -

- Low pathogenic form
- Highly pathogenic form.

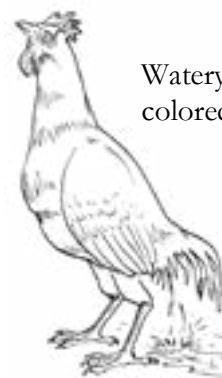
### Signs of low pathogenic avian influenza in birds



Coughing,  
sneezing and  
nasal  
discharges



Uncoordinated  
movements, ruffled  
feathers and excess  
thirst



Watery green  
colored feces

Head and  
neck are  
swollen.  
Combs and  
wattle are  
swollen and  
bluish in color



Other signs of low pathogenic form are: -

- Reduced egg production.
- Soft shelled eggs.
- Skin areas that are not covered by feathers are pale and look bruised.

### Signs of highly pathogenic avian influenza in birds



Sudden death of wild and domestic poultry. Many deaths

Dullness and sneezing



### Transmission of Avian Influenza

All discharges from sick birds are infective – saliva, nasal discharge and feces.



Birds (wild and domestic) become infected through direct contact with discharges of sick animals, feeds and equipment



Human become infected through contact with discharges, excretions and fluids of sick and dead domestic or wild poultry, consumption of under cooked poultry meat

### Risk factors and persons at risk of infection

- Poultry keepers.
- People who purchase and transport poultry.
- People who slaughter poultry at home and in towns - such as workers at restaurants, boys and girls that are asked by parents to cut the neck at home, people removing feathers.
- People who sell poultry products – eggs, meat parts.
- Veterinarians, animal health workers and wildlife handlers.
- Children who care for or play near poultry houses.
- Handling of wild birds or domestic poultry that have died of unknown cause.
- Consumption of uninspected meat of wild birds or domestic poultry.
- Handling of sick wild birds or domestic poultry without proper knowledge and skills.

### Prevention and control of Avian Influenza



Avoid contact with wild birds that have died of unknown causes



Dead birds should be buried deep, or burned



Report cases of sick birds to the animal health worker

## Newcastle disease

Newcastle disease is a viral disease mainly affecting poultry. The disease commonly occurs as outbreaks and is characterized by watery diarrhea, sneezing, watery nasal discharge and deaths of many birds.

### Signs of Newcastle disease in human

In human, Newcastle produces a transitory conjunctivitis. However, the condition has been limited primarily to laboratory workers and vaccination teams exposed to large quantities of virus. Conjunctivitis from NDV infection was observed among workers eviscerating poultry in processing plants before poultry vaccination was widely practiced.

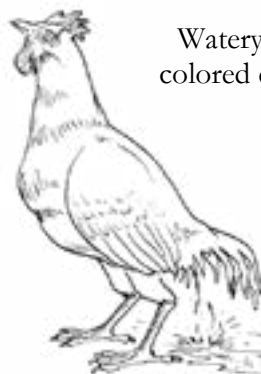
The disease has not been reported in people who rear poultry or consume poultry products.

### Signs of Newcastle in poultry

Dullness  
and  
sneezing



Watery green  
colored diarrhea



Death of  
poultry

## Transmission of Newcastle disease



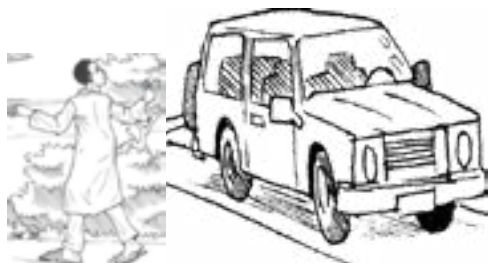
Source of infection are discharges of sick animals – droppings and nasal discharges



Birds become infected through direct contact with discharges of sick animals or feeds, water or objects contaminated by discharges



Infection can be transmitted through contact with poultry cages, feed troughs, watering troughs, feeds and water



Contaminated soles of shoes and tires of cars carry virus from contaminated locations to other location



The virus can penetrate egg shells and infect chicken embryo



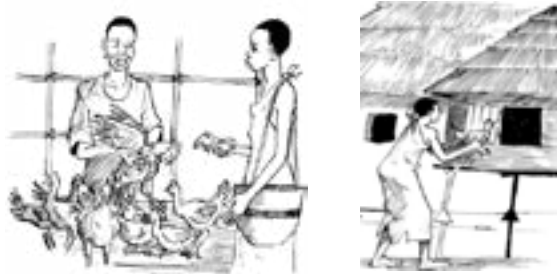
Newcastle disease virus can survive out of poultry host for weeks



## Prevention and control of Newcastle disease



Routine and timely vaccination of poultry



Newly introduced poultry should be quarantined before mixing with the rest of the flock



Tires of vehicles and feet of persons entering poultry places should be disinfected before entry into poultry units



Proper hygiene of feeding and watering equipment, water feeds, poultry housing



Cases of sick birds should be reported to the animal health workers immediately



Dead birds should be buried 6 feet deep, or burned



## **PART SEVEN: BUSH MEAT**



## Ebola Hemorrhagic Fever

Ebola hemorrhagic fever (EHF) is a zoonotic highly fatal viral disease. Occurrence of the disease in human is associated with interaction with monkeys and fruit bat.

### Signs of Ebola in human

Ebola presents as fever, severe headache, muscle pain, fatigue, diarrhea, vomiting, stomach pain and bleeding. In later stages, generalized hemorrhages in body tissues, multiple organ failure and death.



Fever, severe  
headache and  
fatigue



Vomiting



Stomach pain

## Transmission of Ebola

Infection through direct contact with mucus membranes such as of eyes, mouth or nose



Objects (needles, syringes as well as beddings, clothes, towel and handkerchiefs) that have been contaminated with body fluids from a sick person or from the body of a person who has died from Ebola

Infection through direct contact with broken skin



Blood, fluids and tissues of infected primates (apes and monkeys) and fruit bats



Blood or other body fluids (saliva, sweat, urine, vomit, feces, breast milk, and semen of sick person or person that has died from EHF)



Possibly infection from contact with semen from a man who has recovered from Ebola

## People at risk of infection by Ebola

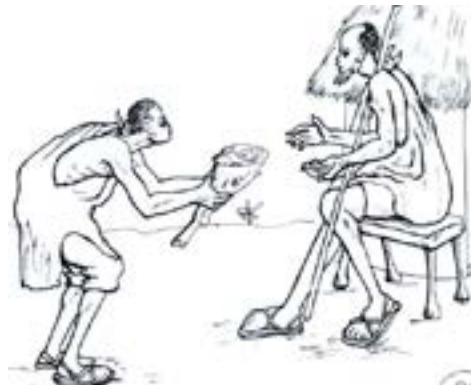


Medical health workers are at high risk of infections due to handling of EHF patients



Family members and friends who care for or interact with EHF patients are likely to come into contact with contaminated material

Slaughter of monkeys is likely to introduce infection if the monkey is infected



Handling or consumption of bush meat

## Prevention and control of Ebola

- Never slaughter and handle bush meat without permission from authority
- Never handle bush meat without proper protection
- Never handle bush meat of unknown source
- Only inspected animals should be slaughtered.
- Practice careful hygiene. For example, wash your hands with soap and water or an alcohol-based hand sanitizer and avoid contact with blood and body fluids (such as urine, feces, saliva, sweat, vomit, breast milk, semen, and vaginal fluids).
- Healthcare personnel providing patient care should use dedicated medical equipment (preferably disposable, when possible). Proper cleaning and disposal of instruments, such as needles and syringes, also are important. If instruments are not disposable, they must be sterilized before being used again. Without adequate sterilization of instruments, virus transmission can continue and amplify an outbreak.



Personal hygiene



Protective attire for health workers

- Avoid contact with bats and non-human primates or blood, fluids, and raw meat prepared from these animals.
- Do not handle items that may have come in contact with an infected person's blood or body fluids (such as clothes, bedding, needles, and medical equipment).
- Avoid unprotected sexual contact with partners who have recently recovered from Ebola
- Avoid funeral or burial rituals that require handling the body of someone who has died from suspected case of Ebola.
- Do not make unauthorized entry into facilities where Ebola patients are being treated
- Wear appropriate personal protective equipment when in contact with suspect material or Ebola patients
- Practice proper infection control and sterilization measures for equipment and beddings.
- Isolate patients with Ebola from other patients.
- Avoid direct, unprotected contact with the bodies of people who have died from Ebola.
- Notify health officials if you have had direct contact with the blood or body fluids, such as but not limited to, feces, saliva, urine and vomit of a person who is sick with Ebola. The virus can enter the body through broken skin or unprotected mucous membranes in, for example, the eyes, nose, or mouth.

## **PART EIGHT: HANDLING OF DRUGS, MEDICINES AND OTHER MEDICAL PRODUCTS**





## Handling of drugs, Medicines and other medical products

Drugs, medicines and other veterinary materials used for treatment, control and prevention of diseases in livestock and human may be harmful to human and the environment. This may result from poor disposal and other improper handling of drugs, medicines and other medical material.

### Forms of poor handling



Careless disposal – into the compound, river, water well, bore hole or pasture land



Under dosing is bad use of medicines



Over dosing is bad use of medicines

- Careless storage
- Use of spoiled medicines.
- Use of expired medicines

## Dangers of poor handling



Children may accidentally ingest medicines or injure themselves with carelessly disposed materials and drugs



Sharp objects such as broken bottles, needles and scalpel blade from poor disposal may cut or prick people or animals



Due to drug residues in milk or meat, when consumer is sick, no response to treatments because disease pathogens are resistant to treatment

- Drugs are chemicals and may contaminate the environment leading to various forms of degradation
- People and animals may be poisoned due to use of water from bore hole, well, river or pond
- Animals may be poisoned due to contaminated pastures
- Microorganisms may develop resistance to drugs due to rampant misuse
- Residues of medicines in milk and meat may result into drug resistance.

## Safe handling and disposal of drugs, medicines and medical materials

- Never pour contents onto grass, plants, on ground, into the river, pond or into water well.

Never use food containers such as soda bottles, containers of cooking oil or bottles of juice to store medicines



Store drugs, medicines and other medical materials in cool, dry place away from effects of direct sunshine, and away from reach of children



Ensure drugs, medicines and other medical materials used are not expired



Withdrawal periods for use of milk and before slaughter should be observed. If milk or meat from treated animal is used before end of withdrawal period, residues of medicines would still be present in milk or meat



Do not contaminate the environment with waste from drugs, medicines and other medical materials



Wastes from drugs, medicines and medical materials should be disposed off through burning in an incinerator or controlled dumpsite

## Glossary

Aerosol	Through the air
Encephalitis	Inflammation of the membranes covering the brain
Hallucinations	Imaginary sensations of images, smell and sounds
Herbivores	Animals that graze or browse on grass, shrubs, leaves and pods
Transmission	To convey disease pathogens from one point to another
Pathogens	Disease causing microbes and parasites
Rales	Abnormal inhalation and exhalation sounds indicating fluid in respiratory tract
Zoonoses	Any sickness that can be transmitted between animals and people, causing health problems in human beings but not necessarily in animals
Jaundice	Yellowing of mucus membranes by breakdown product from blood

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